QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SWEET CLOVER.

The cultivation of sweet clover as a fodder for stock has many advocates, but still more adversaries. We lately received the following note on the plant:—

"Sweet clover is now grown for soil-improvement purposes, and as a pasture and forage crop. It does well on any soil, but more particularly on the poorer types, on which it gives a much better result than lucerne, and on account of its biennial character lends itself readily to rotation. The large roots, which penetrate deeply, break up the lower layers of soil, and when they decay, after the second year, add much humus to it.

"Like lucerne it has the ability to obtain nitrogen from the air by means of nitrogen-gathering bacteria which live in the tubercles on

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the roots. For quick results in improving the soil it is therefore superior to most other crops.

"The seed-bed needs to be solid and compact, and corn stubble or potato ground is preferable to newly ploughed fields; when ploughing is necessary it must be several months previous to sowing. Fertilisers are unnecessary, but it is best to lime the soil.

"Sweet clover produces early and late grazing, and on account of its vigorous growing habits will pasture more stock per acre than most other pasture grasses. It very rarely causes bloat, and for this reason is preferable to lucerne. Hogs, cattle, horses, sheep, and chickens thrive on it when given a little grain in addition."

In the February issue (1916) of the "Agricultural Gazette" of Canada four pages are devoted to the experiments made with this plant in Nova Scotia, Quebec, Ontario, Saskatchewan, and Alberta, and from the experience so far gained, it does not appear that sweet clover (*Melilotus alba*) is superior to red clover, as is shown by the following table, being the average of two years' experiments in tons per acre of pasture crop at the Agricultural College, Guelph, Ontario:—

Sweet Clover Compared with Red Clover.

Periods of Cutting.	Sweet Clover.	Common Red Clover.
First cutting	11·0 ..	13·5
Second cutting	1·5 ..	1·4
Third cutting	2·5 ..	2·9
Fourth cutting	3·0 ..	4·6
Fifth cutting	1·9 ..	2·0
Sixth cutting	0·9 ..	1·6

These results show that, with one exception, in the average of the two years, the common red surpasses the sweet clover in yield of pasture crop per acre at each of the cuttings. *In the total amount of pasture per acre per annum the common red clover surpassed the sweet clover by fully 5 tons, or by about 25 per cent.*

Various tests were also made in cutting the sweet clover at different stages of growth for feeding to different classes of farm animals; but, in all instances the animals refused to eat the crop, although, in some cases, it was cut when quite young and tender. The bitter flavour of the crop seemed distasteful to the animals, and apparently, they were not starved long enough to force them to develop an acquired taste. *If the crop is to be used for hay production it seems essential to cut it before any bloom appears.* There seems to be more difficulty in curing hay from sweet clover than from red clover or from alfalfa (lucerne).

The professor of field husbandry, Saskatchewan, reported that the so-called sweet clover (*Melilotus alba*) is a tall-growing biennial plant, having coarse branching stems which bear white blossoms, and, except when young, carry relatively few leaves. It is a "legume," but not a real clover.

UNDESIRABLE QUALITIES.

Sweet clover has several very undesirable qualities. It is bitter, coarse, hard to cure, apt to become an impurity in alfalfa seed, and in waste places may become a weed. . . . . It is our opinion that *Melilotus alba* will not become a weed on land that is ploughed every year. It carries a large percentage of moisture which makes it difficult to cure, and, in addition, the leaves fall off readily after drying. On account of these difficulties it would seem that, at present, the best use can be made of this crop by pasturing it. It is possible that it may be found useful as a silage crop, but at present no data is available concerning its value as silage.

The seed resembles alfalfa so closely that, if once mixed, the two crops cannot be satisfactorily separated. For this reason the use of sweet clover in possible alfalfa seed-growing centres should not be encouraged.

GOOD QUALITIES.

Among the redeeming qualities of sweet clover are, first, its suitability to the climate; second, its productiveness; third, its biennial character; fourth, it is a legume; and fifth, it may be grown as an intertilled crop. It should not be forgotten, however—(1) that sweet clover is bitter, particularly in the later stage of its development; (2) that it is coarse in texture, and therefore unpalatable, and, in the mature condition, relatively indigestible; (3) that it is hard to cure on account of its large moisture content; (4) that it may become an undesirable plant in alfalfa seed-growing centres; and (5) that much more information must be obtained concerning it before it can be rejected as being worthless, or as being more harmful than beneficial, or accepted as a forage crop suitable for general use.

Mr. H. C. Quodling, Director of Agriculture, Queensland, to whom the question as to the value of sweet clover was submitted, says—"We have *Melilotus parviflora* (Hexham Scent) as a weed in the cereal-growing land in parts of the Darling Downs. *M. alba* grows stronger and is also scented. Both are hardy and I think *well worth leaving alone.* Confined to the improvement of coastal sandy lands, either of the plants might work wonders."

BURNT TIMBER AS A POTASH PROVIDER.

At a meeting of the Inman Valley Branch of the Agricultural Bureau of South Australia last year, amongst the several questions discussed was that of the value of wood ashes as a source of potash. The Director of Agriculture (Professor Arthur J. Perkins) delivered an address which took the form of comprehensive replies to a series of questions submitted by members. The final question was—

"What are the valuable properties in wood ashes, and will it pay to gather them when burning up timber?"

The Director explained that the value of wood ashes varied according to the type of the timber burnt. "The chief useful ingredients in wood

ashes," he said, "are salts of potash and lime. The potash is chiefly in the form of carbonates, and to a less degree in the form of sulphates, silicates, and, occasionally, chlorides. All these potash salts are soluble in water, and are therefore readily available to plants. There are also appreciable quantities of phosphoric acid. It should be noted, of course, that loose heaps of ashes exposed to rain lose much of their value, and that the figures I will give, indicating the percentages of salts present, refer to fresh ashes that have not been leached. From the small number of analyses we possess it would appear that the ashes of Australian timbers are less rich in potash than those growing in Europe. The following are a few examples of the composition of the local timbers:—

	Potash. Per Cent.	Phosphoric Acid. Per Cent.	Lime. Per Cent.
1 Mallee wood ..	2·42	0·48	40·90
2 Stringybark ..	1·25	0·82	8.54
3 Red gum ..	5·20	3·20	35·98
4 Peppermint ..	4·06	1·33	28·28

"Now, if we try to put a money value on the wood ashes of red gum, which are the richest of the four examples given, we shall base our estimate on 36·38 per cent. super. at £4 per ton on the one hand, and sulphate of potash at £14 per ton on the other. On this basis the value per ton of red gum wood ashes would be about £2 5s. 6d., with about 1,430 lb. of lime (calcium carbonate) thrown in.

"The average dressing of sulphate of potash for soils and crops needing this manure would be about 56 lb. to the acre. On the figures given this dressing will correspond to 10 cwt. of mallee ashes, 19 cwt. stringybark ashes, 5 cwt. red gum ashes, and 6 cwt. peppermint ashes.

"As to whether it will pay settlers to collect these ashes depends altogether on the labour involved in the operation. And with the data I have given I think that each individual should be able to work out this matter for himself. Owing to the abnormal conditions in which we find ourselves, it should be stated that, instead of £14 per ton, as much as £30 per ton is now charged for sulphate of potash. And these prices are likely to continue throughout the duration of the war. In the circumstances, therefore, where potassic manures are required it seems certain that the collection of ashes will prove remunerative."

A CHEAP SILAGE MATERIAL.

In our issue of January last we published a paper on silage by Mr. Arthur Jones, senr., of Bondoola, Rockhampton, which has attracted much attention amongst the dairying community. Mr. Jones now writes:—"It has occurred to me since writing *re* 'Cheap Silage,' that many who read it may think that the maize stalks, at the stage to which they had arrived, had lost most of their food value, and, as this is a very important point, I would like to enlarge on it. The usual system is to cut the maize at a very immature stage, or to cut it at the time when the cobs are full grown, but with the grain on the cobs not far

enough advanced to pull them for grain. At this former stage the stalks are at their best, but it is doubtful if grain on the cobs does not deteriorate or lose more or less of its value by fermentation in the silo. By the method we adopted, the cob was left a few weeks longer until the grain was mature, and then, after pulling, the stalks were allowed to lie by for a few days in the sun to dry, sufficiently to cart and spread, say a foot deep, to dry on the floor. If rain should fall during the time it is in the field, it would not receive any injury, if it were not left too long lying on the ground, provided sufficient stalk were left to form a layer and the cobs placed on it to keep them from the ground; thus it would take a very considerable time before it would be injured in the least. If the stalks are cut as soon as they have reached the above stage, they may have lost some of the nourishing qualities from the lower joint, and this may be easily tested. If it has lost none of its sweetness, it has not lost anything. It is not generally known that maize stalks come first to maturity, or to their best food stage, in the length between the bottom joint and the next, extending upwards as it matures, and that it should never be cut for silage until several joints are sweet as in the case of sugar-cane, and this can easily be tested by cutting and tasting. To cut earlier is to lose much of the food value. This is a mistake which is frequently made, in that the greenness and sap are mistaken for food. As the maturity commences at the stalk bottom, so it is that at this part deterioration or loss of food value commences. If, as suggested, the whole plant is left until the cobs are mature, the stalk may have lost its sweetness and become woody in the spaces between the first or second and third joints, but it would still retain its full food value above that, and some food value even in those parts. I would much prefer to leave stalks standing until the stage indicated than to cut them, as they very frequently are cut, before they have arrived at their maturity, independent of the gain made by having the grain to sell or use."

It should be stated that the silage stack mentioned in Mr. Jones's first article was built at Mr. Redland's farm, Barmoya, one of the best maize-growing districts in the State.

PICKLING WHEAT—A REMINDER.

Last wheat season the presence of smut (bunt) in many commercial samples of wheat was sufficient to indicate that a number of growers failed to protect their own interests by neglecting to "pickle" their seed. As the present sowing season is at hand, the following brief notes are given as a reminder:—

The efficacy of any method of treating wheat depends on the removal of the small, dark-coloured smut (bunt) balls, or in breaking them up so that the spores of the fungus can be acted upon and their vitality destroyed. These spores are microscopic in size, and, although wheat may appear to free from infection, it is advisable always to take precautionary measures, otherwise these spores (seeds) germinate at

the same time as the wheat plant, and exist in their tissues, ultimately forming in the matured plants those dark-coloured, smutty ears which give rise to the synonym "stinking smut."

For obvious reasons, sellers of smutted wheat have to suffer a reduction in the market price of their grain.

DIRECTIONS FOR PICKLING WHEAT (BLUESTONE AND LIME TREATMENT).

Mix 1 lb. of bluestone or copper sulphate with 5 gallons of water in a wooden or glazed earthenware vessel. Suspend the bluestone in a bag just below the surface of the water and leave overnight. Iron or metallic vessels are not suitable for bluestone mixture. A hogshead is to be preferred. Rig up a fork and lever alongside of the tub to facilitate lifting of the wheat in and out of the tub. Use an open-mesh jute bag (bran bag) for dipping. The secret of dipping is the rapid and even dipping of each grain, and to secure this, agitate the grain whilst it is in the pickling mixture. Three minutes is sufficient for dipping, after which, the bag should be allowed to drain on two pieces of scantling, allowing the drainings to run into the pickling tub.

Lime Solution.—Quicklime, 2½ lb. Slake the lime in a small vessel with sufficient water to reduce it to the consistency of cream, and add it to 22 gallons of water. A clean iron vessel may be used for this.

Transfer wheat from the bag in which it was dipped into the bluestone mixture to a similar open-meshed bag and dip in the lime solution for 2 minutes. Drain and dry thoroughly by spreading in thin layers on bags or tarpaulins.

By dipping into lime water, or, as an alternative, shaking and mixing air-slaked lime or sifted wood ashes over the pickled seed (after draining), the caustic action of the bluestone is checked. Even for immediate sowing, the drier the wheat is, the better it will be for drilling. When it is purposed, after pickling and treatment with lime water, to keep wheat for any time before sowing, it should be thoroughly dried out previous to rebagging.

Another method of pickling wheat is to empty a few bags of seed on to a wooden or concrete floor and sprinkle the grain with a strong solution of bluestone (10 per cent.), whilst it is being turned over and over by means of two men shovelling in unison until each grain appears to be evenly moistened.

A 10 per cent. solution is made up by using 1 lb. of bluestone for every gallon of water.

Solutions of this strength are apt to destroy or weaken the germinating capacity of a considerable percentage of grain unless the seed is sown immediately after treatment. If it is purposed, on the other hand, to keep the seed for any length of time before sowing, it should be sprinkled with air-slaked lime, and the grain turned over and over until it is lightly and evenly coated with it, and thoroughly dried.

To prevent reinfection of grain, dip all bags used for conveying seed after pickling in bluestone mixture, and dry in the open.

A BY-PRODUCT OF COTTON IN THE UNITED STATES OF AMERICA.

The short cotton ahering to Upland cotton seed, which is not removed by the cotton gin, is called "linters," and is removed by a gin specially adapted to the purpose. The percentage of linters obtained from this year's crop in America is the largest obtained from any previous crop, and is computed at 1,000,000 bales. The average weight of the American cotton bale is 520 lb. of clean cotton. Linters are worth about 3s. per cwt., ginned Upland cotton being at from 6½d. to 7d. per lb. Thus the 1,000,000 bales of linters would amount in value to over £696,000. Many thousands of pounds of these linters were, together with the cotton seed, thrown away by the Queensland ginners when cotton-growing was booming here, and Uplands cotton was bringing up to 2s. per lb. in the Liverpool market. Should cotton-growing again be largely undertaken by Queensland farmers—as we have reason to hope that it will—the value of the by-products will assuredly not be lost sight of by the ginnery owners, in which case the growers would participate in the increased profits derived from them.

AN OLD WHEAT STACK.

In April, 1908, we gave an illustration of a stack of wheat which at that time had been standing for thirty years on Mr. Selby's farm in Lincolnshire. This is the same stack, a further account of which is given in "The Farm" (March, 1916), Adelaide. It was stated in our notice of the stack that no rat had even touched it during that lengthy period.

"Thirty-four years ago" (writes "The Farm") "Mr. Phillip Selby of Aisby, South Lincolnshire, England, harvested a field of wheat, and

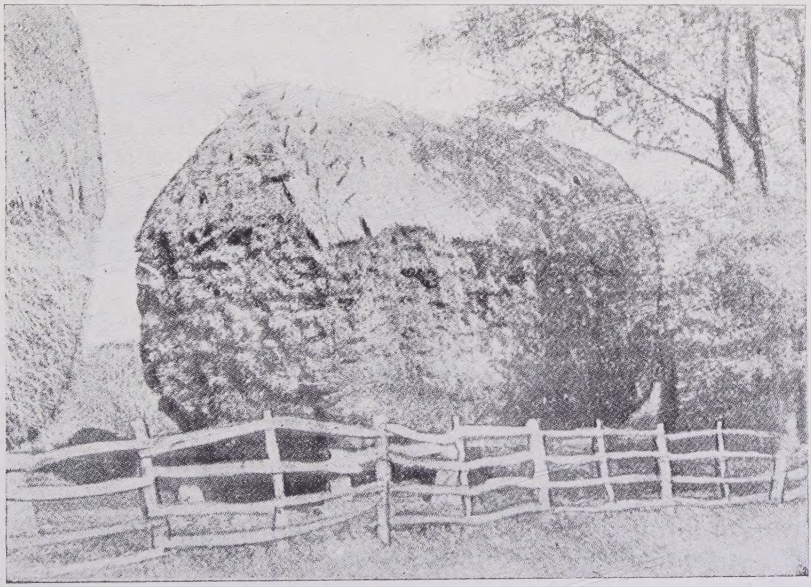

Plate 14.—A Remarkable Wheat Stack.

when the harvest was over he declared he would not thrash it until it had attained a certain price. What that price was no one ever knew but himself, not even his nearest relative, and about a year ago Mr. Selby died, taking his secret with him. The stack contained the produce of about 9 acres. On half a dozen occasions, at least, it has been thatched. Often was the owner twitted by his fellow-farmers regarding the stack, but Mr. Selby was obdurate, and to this day, had he lived, that stack would probably now be standing. Succeeded in the business by his son, however, the latter decided that the old stack would be thrashed, and, although thirty-four years have elapsed since it was harvested, the grain was found to be in excellent condition. The London 'Field' stated that Mr. H. Bell, of Grantham, bought the wheat for 60s. per quarter last August, and the delivery has proved to be about three quarters to the acre, the corn being exceedingly fine, weighing about 60½ lb. to the bushel. Mr. Bell declares it is better than any he has milled for thirty years. The purchaser has had some of the wheat made into bread, and very good it is. It is questionable whether any parallel can be found in the annals of British agriculture, and our contemporary expresses the hope that a sample of the wheat may be preserved at some agricultural college or museum for the edification not only of the present but of future generations."

MARKET GARDENING.

TOMATO WILT.

This disease of the tomato is a bacterial blight. The attacked plants wilt suddenly and, after a time, leaves and stalks become discoloured and die. The disease is mostly spread by inoculation caused by the bites of insects. The organism causing the trouble is believed to be present in the soil, from which it spreads to the plants. Sour soil aggravates the evil.

The first step to take is to spray with a poisonous mixture and destroy those insects which move from plant to plant, thus spreading the disease. One ounce of Paris Green in 10 gallons of Bordeaux Mixture will effect this. Carefully dig round the diseased plants, and prevent the spread of the web-like fungus which extends its meshes from plant to plant underground, boring directly into the healthy cortical cell, and thus giving entrance to the bacteria.

To prepare Bordeaux Mixture, use 6 lb. copper sulphate, 4 lb. quick lime, to be freely slaked, and 22 gallons water. Dissolve the bluestone in 10 gallons of water, make a whitewash with the lime, and strain to separate the grit, and bring the milk of lime to 10 gallons. Mix these up to 22 gallons. Use only wooden or earthenware vessels. When the foliage is out use the half-strength mixture by diluting in double the quantity of water. To make sure that the mixture is safe to use on tender foliage, insert a new nail or the blade of a penknife for at least half a minute; if copper is deposited on the steel, more lime must be added.

Pastoral.

SHEEP ON COASTAL AREAS.

BY W. G. BROWN, Instructor in Sheep and Wool.

In the April number of the "Queensland Agricultural Journal" appears a very interesting article on "Sheep in the Burnett District." From this article it is easy to see that "Briny" has known sheep in coastal areas for many years.

In this case, the Burnett district is under review; consequently, this article is valuable, coming as it does from one who knew it when the sheep were giving way to cattle. One of the chief difficulties I experienced when I began to look into the question of "sheep for the coastal areas," was to get authentic and intelligent information as to the cause of the wholesale exodus of sheep away from coastal lands in former days.

As I have stated elsewhere, I found that the chief causes of the failure were—

1st. Unsuitability of the natural grasses.
2nd. Parasitic diseases.
3rd. "Scald-foot," misnamed "foot-rot."
4th. Unsuitable sheep.
5th. Low prices for mutton and wool.
6th. The stocking up of the finest natural pastures in Australia—the Western country of Queensland.

In reviewing the article, I am placing the views I hold as to failure in the past first, because I can take "Briny's" statements and compare them with those enunciated. He has thrown a welcome light on some of the problems which exist to-day on the keeping of sheep on coastal areas.

Taking, then, "Briny's" statements in their order, I notice that he says—

"After inquiry from old settlers, shearers, &c., I find that, although it is fully given as a reason to-day, worm trouble was never mentioned ten years ago as a cause of sheep leaving the Burnett in the early days."

Now, most of my inquiries from pioneers, old shearers, and others, elicited that "bottle-jaw" was prevalent in the old days in most coastal areas. "Bottle-jaw" is symptomatic of anæmia in sheep, and anæmia (or lack of blood) is caused by stomach worms in sheep in most cases. I therefore concluded that worms must have been prevalent in sheep in the past.

"Briny" himself says: "Worms were probably present, and were possibly at times an unrecognised cause of mild trouble, but it is certain . . . that under conditions of shepherding *over large areas* (the italics are mine) in which sheep were then kept, they were not affected

with worms to anything like the disastrous extent they were infected . . . when paddocked in small areas, heavily stocked.''

Granted. Yet I know of areas in Western Queensland, where the paddocks are not less than 4,000 acres in area, so heavily infected with worms that the sheep were withdrawn and cattle placed on them. A very essential part of my instruction to farmers is that the keeping of sheep on coastal areas must be confined to such country which may either be cultivated or laid down with artificial grasses.

One very good reason for this is the comparatively high prices for land—prices which, year by year, are increasing far beyond values which would give an adequate return for mere grazing on natural grasses, even if they were suitable for sheep.

If these lands would pay at the price to graze on natural grasses, it would involve the use of comparatively large areas.

I am of opinion that a holding of, say, 320 acres of good land laid down in Rhodes or paspalum, and cut into small paddocks of not more than 20 acres each, will carry not fewer than six sheep to the acre. I know of one place at Maleny, Blackall Range, where 160 sheep have been running for fourteen months on 16 acres of paspalum. This place belongs to Mr. James Cork. The sheep were prime fat when I saw them four weeks ago.

I know of several places on the coast where the dairy stock was on agistment, yet the sheep running on them were fat. ''Briny's'' instances of selectors who kept sheep successfully for three years, only to fail through worm troubles, is very interesting; but I would like to point out that worms do not come spontaneously on any country. They must first have been introduced. If one sows land with wheat, one expects to obtain a crop of wheat many times greater than the amount of the seed sown. Similarly, if one sows land with the seed of worms—*i.e.*, eggs—it can only be expected that a very much larger crop of worms will eventually develop.

It is beginning at the wrong end to drench sheep on land already infested. The sheep should have been cleared of worms before being put on to the clean land they infected afterwards.

There is another point in the article in regard to worm troubles. ''Briny'' says—''. . . after being six months in paddocks, 350 of the poorest of these sheep were travelled to the Darling Downs. So poor and worm-ridden were they that the owner was much criticised for even starting them. They, however, improved from the outset, and this in spite of the fact that the greater part of the route lay through sheep-condemned country. So greatly had they improved, that they sold for 3s. per head in advance of their original cost in the same 'state of wool.' '' The assumption is, of course, that by escaping from the small, over-stocked, worm-infested paddocks, they had escaped from the worms. That certainly was not the main reason for the improvement, for the sheep took their stock of worms with them, dropping eggs, incidentally, all along the route they travelled. This is the real reason.

Many sheepmasters on wormy country believe that when there is a flush of green and nutritious food all danger from worms disappears, because the green feed clears the parasites out of the sheep's system. This is not so, as may be easily shown.

Stomach-worms in sheep live on the blood drawn from the veins of the fourth stomach of the animal, where they are attached soon after being taken up in the grass of infected pastures, to stay during the life-time of the worm or its host.

It is obvious that if the worms are sufficiently numerous the sheep will die from loss of blood or anæmia.

If, however, highly nutritious food be given the animals suffering from worm invasion, and which have been living on short commons in an overstocked paddock, more and better blood is at once produced in the animal.

As soon as the sheep can keep himself and the worms with which he is infested, with a full supply of blood, he immediately begins to improve in condition. As he keeps on assimilating good fodder, he makes more and more blood and reaches a good condition of health.

He is keeping the worms in blood, and is also keeping himself in condition, because he is getting such good food that he has a surplus of blood for the use of his own economy. But—and here is the application of the above—the moment the food falls below what will keep sheep and worms too, then the sheep loses blood until he dies.

That is why weaners die much sooner than older sheep. They have not the reserve of strength to oppose loss of blood, such as mature sheep possess.

It is certainly not "natural," as "Briny" states, "that sheep should have stomach-worms in limited numbers." If sheep possess worms in limited numbers, it is quite certain that, given moisture and warmth, it will not be long before they possess worms in unlimited numbers.

This *in re* worms will explain why, when sheep range over a large extent of country, and can pick and choose their feed, they do not apparently suffer from worms. Yet the sheep may be, and probably are, full of worms.

Of course, as "Briny" states, the article is dealing only with natural grasses in open forest land. The principles, however, both for natural or artificially grassed land are alike. If land can be procured in any part of Queensland at a cheap rate (not exceeding £2 per acre for the best), the natural grasses will give a good return if grazed intelligently. When land rises above that price (£2 per acre), the plough *must* go in or artificial grasses must be laid down for any class of stock. Limitation of space precludes a greater extension of this article, so I shall conclude with my *credo* in regard to "Sheep on Coastal Areas."

I believe that the great bulk of the land on coastal areas, from the Tweed to Rockhampton (perhaps further North), is very good, pos-

sessing, as it does, a better average rainfall than, say, the Darling Downs. Anything which feeds sheep may be grown to advantage.

I believe that paspalum or Rhodes grass will feed at least six sheep per acre.

I believe merino sheep in their purity to be unsuitable to coastal conditions and high-priced land. They are slow maturers, delicate feeders, and have not as much sense as long-wool or their crosses.

I believe that the enormous areas of scrub and other lands on coastal waters will, before many years, support millions of sheep and fat lambs.

I believe that the business will be most profitable to comparatively small holders. One man can easily attend to the wants of 1,000 sheep, excepting at shearing time.

And I *know* that one good crossbred ewe will give £1 sterling per annum in lamb and wool at prices lower than obtain to-day.

In conclusion, I have to thank "Briny" for an informative and lucid article. If I have differed in my conclusions on the evidence he offers, and upon which he forms other conclusions than mine, it is not from any spirit of opposition or controversy, but to endeavour to say the truth as it appears to me.

SHEEP IN THE BURNETT DISTRICT.

Mr. E. H. Goodwin, of Sunny Vale, Mount Larcom, commenting on an article on "Sheep in the Burnett District," which appeared in our April issue, writes:—

"I do not think that the worm trouble was very great, except on the poorer and more sandy runs. I was on Ban Ban in 1865, which then carried between 30,000 and 40,000 sheep, and neither worm or foot rot gave any great amount of trouble. I made three trips with wethers from Ban Ban to New South Wales, and we had no excessive losses.

"Later on I was on Wigton and Culcragie, and both these runs are on sandy and poor country, and I have killed sheep with the stomach full of worms, and also had considerable trouble with foot rot. At another time 'bottle' was prevalent among these flocks. I think, however, that the main cause of sheep leaving the Burnett was the spread of spear grass. Eidsvold was completely ruined by this grass.

"The Burnett sheep always improved very quickly when they got to the saltbush country in New South Wales, and, if they were badly infested with worms, it is evident that change of diet relieved them of the trouble, and the better the diet the less chance for worms. This shows that small paddocks will carry sheep well, provided the diet is good

enough, but that on poor sandy country the sheep has no chance of doing well no matter how large an extent of run it may have. I do not pose as a sheep expert, but my advice to farmers is, to feed their sheep generously, and never lose sight of the obvious fact that sheep are *not* goats."

SHEEP ON THE COAST.

The accompanying illustration depicts the progeny of ewes bred on coastal scrub land at Eumundi by Mr. Munro Hull. These lambs are just five months old, and their appearance is good evidence that sheep of the right breed, fed not exclusively on native grasses, but on lucerne, paspalum, Rhodes, and other artificial grasses, will thrive and pay the sheepowners in the coastal areas. The number of sheep on these lands, we are informed, is rapidly increasing, and Mr. W. G. Brown, Instructor

PLATE 15.—CROSSBRED LAMBS, FIVE MONTHS OLD, BRED AT EUMUNDI, BLACKALL RANGE.

in Sheep and Wool, who has devoted much time to the study of the successful rearing of sheep on country for years considered quite unadapted to sheep-breeding, has so clearly demonstrated the possibility of the industry on the coast, that it has been said by some that ere long there will be tens of thousands of sheep on farms now hardly cultivated except by dairy farmers and sugar and arrowroot growers; and, in short, the coastal areas bid fair to become the New Zealand of Queensland, if not of Australia.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1916.

Four thousand five hundred and seven eggs were laid during the month. The final result of the competition is a tie between Messrs. Bertelsmeier and Nicholson, with 1,530 eggs each. A. H. Padman takes third place with 1,481 eggs to his credit. S. Chapman wins the monthly prize with 123 eggs. A full report on the whole competition will be issued in due course. The following are the individual records:—

Competitors.	Breed.	March.	Total.
C. B. Bertelsmeier, S.A....	White Leghorns ...	107	1,530
J. D. Nicholson, N.S.W.	Do.	115	1,530
A. H. Padman, S.A.	Do.	77	1,481
A. W. Bailey	Do.	88	1,451
Mrs. Munro	Do.	74	1,446
J. M. Manson	Black Orpingtons ...	97	1,445
J. R. Wilson	White Leghorns ...	81	1,441
E. F. Dennis	Do.	87	1,440
W. Parker	Do.	104	1,437
J. Gosley	Do.	83	1,433
King and Watson, N.S.W.	Do.	96	1,429
Kelvin Poultry Farm	Do.	88	1,427
J. M. Manson	Do.	74	1,425
Jas. McKay	Do.	85	1,425
H. Hammill, N.S.W.	Do.	100	1,423
C. Knoblauch	Do.	97	1,417
E. A. Smith	Do.	105	1,413
A. T. Coomber	Do.	91	1,412
T. Fanning	Do.	100	1,407
W. Purvis, S.A.	Do.	108	1,405
Moritz Bros., S.A.	Do.	112	1,384
E. A. Smith	Black Orpingtons ..	112	1,381
R. Burns	Do.	105	1,373
W. Lindus, N.S.W.	White Leghorns ...	113	1,372
O.K. Poultry Yards	Do.	68	1,369
T. Fanning	Black Orpingtons ...	78	1,355
J. H. Gill, Victoria	White Leghorns ...	111	1,354
C. T. Clark	Do.	79	1,351
Cowan Bros., N.S.W.	Do.	82	1,343
Mrs. Jobling, N.S.W.	Black Orpingtons ...	60	1,340
E. V. Bennett, S.A.	White Leghorns ...	71	1,337
R. Burns	S. L. Wyandottes ...	106	1,330
S. E. Sharpe	White Leghorns ..	82	1,315
Geo. Tomlinson	Do.	93	1,315
E. Le Breton	Do.	81	1,309
F. Clayton, N.S.W.	Do.	50	1,392
W. Mencely	Black Orpingtons ...	79	1,286
R. Jobling, N.S.W.	White Leghorns ...	82	1,283
Derrylin Poultry Farm	Do.	71	1,280
Cowan Bros., N.S.W.	Black Orpingtons ...	81	1,273
J. G. Richter	White Leghorns ...	74	1,267
S. Chapman	Brown Leghorns... ...	123	1,260
Loloma Poultry Farm, N.S.W.... ...	Rhode Island Reds ...	83	1,255

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	March.	Total.
W. Lyell	White Leghorns ...	65	1,244
G. H. Turner	Do.	82	1,234
J. Zahl	Do. (No. 1)	75	1,228
J. Zahl	Do (No. 2)	75	1,201
F. Clayton, N.S.W.	Rhode Island Reds ...	103	1,186
R. Jobling, N.S.W.	S. L. Wyandottes ...	66	1,176
J. Aitcheson	White Leghorns ...	46	1,172
E. Pocock	Do.	59	1,154
W. H. Forsyth, N.S.W.	Do.	73	1,141
J. R. Johnstone	Plymouth Rocks ...	30	871
Totals	...	4,507	70,848

NEW GUINEA BUTTER BEANS.

There are few, if any, purely tropical plants which will not thrive to perfection in some portion of Queensland. The mangosteen, which is a native of the hottest climates, such as Java, parts of India, and other such countries, and which for years defied all attempts to acclimatise it, has been successfully grown at the Kamerunga State Nursery, and has borne excellent fruit. Another tropical plant, the New Guinea butter bean, thrives well in the coast districts. How well, is shown in the accompanying photograph of the bean growing on a trellis, on the property of Mr. Charles Collins, M.L.A., at Gympie. We are informed that several of the beans were over 3 ft. in length and weighed up to 13 lb.

PLATE 16.—NEW GUINEA BUTTER BEANS.

The Orchard.

NOTES ON THE DYING OF CITRUS TREES.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In consequence of the many complaints that had been received by the Department of Agriculture and Stock of citrus trees dying in different parts of the State, and particularly in the Wide Bay District, I took the first opportunity after my return to this State, of making a personal inspection of some of the affected orchards, as the matter was considered to be one of great importance to the fruit-growing industry and to require immediate attention. As a result of my personal investigation I realised the serious nature of the trouble, and was of the opinion that it was of a very complex nature and probably due to several causes of a more or less obscure origin. This being so, I recommended the carrying out of a very complete and systematic investigation to determine—Firstly, the cause or causes of the trees dying; secondly, the means to be used to stop the spread of the present trouble; and thirdly, the means to be adopted to prevent its recurrence.

My suggestions were approved, and it was decided to commence the investigation by making a careful soil survey of the affected areas. The carrying out of this work was placed in the hands of Mr. F. Smith, B.Sc., F.I.C., of the Chemical Branch of the Department, and this officer has recently submitted a long and valuable interim report on the work already accomplished, including numerous anlyses of soils and waters, biochemical tests, &c. Many of the matters dealt with by Mr. Smith are still under investigation; consequently it is premature to refer to them at present, but there are others, including the incidence of gumming and root rot, on which he throws considerable light. Mr. Smith has also arrived at certain conclusions, and has made several suggestions from which I will quote fully, as, in my opinion, they are worthy of the careful consideration of all citrus-growers. When dealing with the general aspect of the question Mr. Smith states:—

"The relation of plant disease, especially parasitic disease, to conditions of soil environment and nutrition are not entirely known.

"Potter, however ('Science Progress,' No. 18, October, 1910, page 207), states that 'the external conditions to which any plant is exposed have an important bearing on its general health and render it more resistant or more susceptible to parasitic attack.' Temperature, air, and moisture content of the soil and the nature and supply of food constituents are all factors necessarily affecting the general vigour of any host plant.

"With regard to manurial treatment, there is considerable evidence that susceptibility to disease is influenced by the nature of such, and that abundant fertilisation, especially with nitrogenous manures, renders the host less resistent to disease. Generally, phosphate manures induce a high degree of resistance.

"In addition to the nutritional influences indicated, there may exist as conducing causes, unfavourable physical circumstances due to deficiency of drainage owing to formation of hard pan or presence of impervious subsoil, and to deficient æration owing to surface packing; general poverty induced by deficiency of plant food or disturbance due to the presence of bodies toxic to plants in the soil.

"It has been impossible, without data derived from previous mycological investigation, to decide where 'gumming' is to be attributed to parasitic attack, or is evidence of transitory physiological dusturbance due possibly to climatic conditions. There is sufficient evidence to show that 'gumming' is apt to be prevalent in otherwise healthy and vigorous orchards during periods of protracted drought, and is stayed on advent of more favourable meteorological conditions.

"It is possible to ascribe such evidence to purely physiological causes attendant upon the operation of a set of climatic conditions upon peculiarity of constitution, and either the remedy adopted, scarification of the bark, or the normal resumption of active growth is effective in staying the pathological condition by diversion of the nutriment of the sap to production of new tissue—the explanation advanced by Prilleux (M. Prilleux: 'The Production of Gum in Fruit Trees considered as a Pathological Phenomenon,' Comptes Rendus for 1874).

"Considered as evidence of parasitic invasion the same remedy, if promptly applied with treatment of the affected part with disinfectant, is liable to be efficacious by removal and destruction of the organism.

"This means of check appears to have been successfully resorted to in many instances both in the Maryborough and Burrum River orchards.

"Considering all manifestations of gumming as following parasitic invasion, instances of apparent natural recovery are ascribable to the triumph of the host over the parasite due to causes favouring the former.

"Persistent gumming of the stems and branches has sometimes necessitated the cutting off of the tree at ground level when the new growth has been found not to manifest the trouble.

"It appears to be necessary in the case of 'root rot' to distinguish between the condition affecting the roots of certain young trees and that leading to the destruction of the root system of aged orchards. The former is localised and comparatively unimportant in its results, and is regarded as accidental rather than incidental.

"Effective remedial measures have been the removal of affected roots and treatment with tar and lime. The writer is not certain if similar treatment has been tried in the cases of first manifestation of the more important 'root rot' of mature trees.

"With regard to the incidence and comparative incidence of 'gumming' and 'root rot,' it is apparent that—

"1. Root rot may occur without previous marked evidence of gumming.

"2. Root rot is an affection of aged trees.

"3. Root rot comparatively speedily affects considerable areas and more or less rapidly effects the destruction of trees thereon.

"4. Gumming affects trees at an earlier stage of their growth and occurs sporadically—a condition probably indicating variation in susceptibility with peculiarity of constitution.

"5. The rapid spread of root rot over areas indicates the infection of the soil in areas.

"6. The sporadic incidence of gumming (referring to that consequent on parasitic invasion) may indicate non-conveyance of infection by air, but rather by some accidental means.

"The writer, however, does not wish to express definite opinions upon these heads, the questions raised rather appertaining to mycological study, but it would appear that they must be given due consideration in deciding to what extent incidence of disease can be co-related with soil and environmental conditions.

"Apart from the question of means of infection or the specific nature of existent disease it must be held that faulty soil conditions, where prevalent, may be considered as directly contributive to its virulence and spread.

"Attention has, therefore, been directed to the condition of virgin, non-affected, and affected areas for the purpose of showing both the original capabilities and properties of the soils and the change produced by the systems of management adopted, and to reveal such differences between healthy and diseased areas as will contribute to the elucidation of their respective conditions."

Referring to the chemical and biochemical analyses of the Melrose and contiguous soils, Mr. Smith remarks:—

"Chemically there is nothing inconsistent in composition with that of recognised good citrus types in which ideal physical condition is a greater desideratum than supplies of plant food considered necessary for ordinary and rapidly growing farm crops.

"It is significant that the slow progress of disease in the Melrose orchards would characterise the soils as inherently suitable for the normal and healthy development of citrus trees.

"It is probable that general potash and phosphoric acid manuring might be of benefit to orchard trees in heavy bearing. The maintenance or increase of organic matter content might also be advisable by systematic green manuring, especially on individual soils, for the improvement of tilth, and in soils of lighter type as an aid in the conservation of soil moisture.

"It is more apparent that the life-history of a tree, especially its previous prolificness, is a determining factor in its susceptibility to the prevalent root and gumming diseases.

"The Melrose orchards were noted previously for their heavy bearing capabilities, whereas trees on neighbouring areas allowed to go out of bearing through neglect, though of equal age and prone to the ravages of scale pests, remain disease free, providing, however, their position does not preclude the possibility of infection.

"For this reason stimulation to production by heavy fertilisation is not to be recommended, but rather systematic manuring by light applications of less soluble manures. Applications of nitrogenous fertilisers are to be guarded against, even in the unlikely contingency of their proving immediately economic."

Referring to the same matters in the case of the Burrum soils, he also states:—

"The data point to marked alteration in the biochemical condition of long-cultivated soils in the direction of diminished nitrifying power, indicative of deficient or abnormal nitrogen—nutrition, and much lessened oxidative efficiency.

"Both may be considered as possible conducive influences in disease incidence.

"The former effect indicates the highly probable beneficial influence of liberal treatment with forms of lime; the latter may be co-related with the loss of valuable organic forms under cultivation.

"Systematic green manuring, however, is the course to be most confidently recommended for the amelioration of the serious soil deterioration indicated, and obviation of the tendency of the heavier types to surface packing, but it is to be emphasised that no course of manurial treatment will be effective in eradicating the prevalent disease, though improvement of nutritional environment is likely to check its virulence and spread.

"In this connection it would appear that the progress of disease has been more rapid on the Burrum soils, where deterioration of soil condition has occurred, than on the citrus soils of the Melrose area, where no such 'working out' is indicated."

In concluding his report, Mr. Smith summarises the result of his investigations to date as follows:—

"1. Considering the parasitic nature of the disease prevalent in the areas visited, it is not possible to assign unfavourable soil or environmental conditions as primary causes.

"2. It is possible, however, to recognise in conditions unfavourable to normal vigorous or healthy growth, causes contributing to susceptibility to disease.

"3. These may be physical—viz., deficient drainage or aeration; chemical—viz., deficiency of the elements; and biochemical—viz., lack of normal bacterial life adequate and acceptable forms of food supply.

of normal sustained and vigorous growth, and absence of revivifying power due to catalytic oxidation of plant toxins.

"4. An important contributory factor is considered to be heavy bearing with consequent constitutional change predisposing to disease.

"5. The soils of the Melrose area present no features to be definitely considered as adjurant causes. Ameliorative measures recommended are: Maintenance or improvement of physical condition for preservation of free aeration, and conservation of moisture for maintenance of growth through periods of drought. Stimulation of productive function by heavy application of readily available fertilisers is to be avoided.

"6. The soils of the Burrum River orchards evidence marked deterioration under long cultivation—a loss of condition that is considered contributory to the incidence and spread of parasitic citrus disease.

"The principal ameliorative measure is the maintenance of organic matter content by systematic green or organic manuring.

"7. No system of soil improvement will banish the disease from infected orchards or entirely prevent its invasion of uninfected trees.

"8. The most rational method of attack appears to be removal of badly diseased trees with prophylectic treatment of infected trees and soil disinfection.

"9. The writer would urge the further study of varietal immunity and the prosecution of mycological investigation of the organisms causative of the phenomena of gumming and root rot."

From Mr. Smith's report we may therefore conclude—

First: That the dying of citrus trees in the Wide Bay district is not due to unfavourable soil conditions, as neither the chemical nor biochemical analyses of the soils on which the trees have died show any very marked difference from those of the adjacent virgin land or those of the orchards in which trees have not died, except that there is a decided deficiency in organic matter in some of the Burrum soils; but this in itself would not be sufficient to account for the trees dying.

Second: As the cause of the trees dying cannot be ascribed to faulty soil conditions, it must be looked for in another direction, as recommended by Mr. Smith, as it appears to be more a matter requiring the services of a skilled microbiologist than those of a chemist.

A thorough scientific investigation into the nature and cause of gumming, root rot, twig blight, and other parasitic diseases of a fungoid nature attacking citrus trees in this State, is very badly needed, as very little original research has been undertaken here, and, in consequence, we have had to depend largely on the result of the investigations that have been carried out in other parts of the world under conditions that are very frequently in no way comparable with those existing here. Local investigation must be undertaken, and if, as I trust it will be, started shortly, it will undoubtedly throw much light on several matters pertaining to the treatment of our citrus orchards and of the diseases attacking our citrus trees. Such an investigation, to be of the most benefit to the State, must be of a very thorough and highly scientific

nature, and will take a considerable time to complete, so that, although it is more or less of a presumption on my part, I beg to submit the following remarks and suggestions to the careful consideration of our citrus-growers, as it is possible they may prove of value to them pending the carrying out of the scientific investigations by which alone can we hope to arrive at any finality.

Returning to the general question of the trees dying, I must say at once that I am unable to show what is the cause or what are the causes of the trees dying; but, as I stated in the commencement of this article, I am of the opinion that it is a very complex matter indeed, and is probably due to various agencies acting more or less collectively and bringing about the results that have been experienced.

Although the majority of the trees that have died were in full bearing, and possibly some of them may have reached their natural end—in other words, died of old age, this does not apply in all cases, as older trees are still living where much younger ones have died out. At the same time, the question of old age must be considered, as we have no definite information respecting the longevity of citrus trees in this State to enable us to say exactly how long they are likely to live; and, further than that, there is the probability that the age to which the trees will live depends largely on the soil in which they are planted and the climatic conditions under which they are grown. The more even and regular the conditions of growth the longer the tree is likely to live, and the more it is subjected to sudden and extreme changes the sooner, in all probability, it will begin to fail. The climate of many parts of this State is undoubtedly trying to citrus trees, though they certainly stand very rough treatment and recover when conditions become more favourable. Long dry spells frequently produce a stagnation of growth which is succeeded by an excess of growth when the ground has received a good soaking, and these rapid changes tend to weaken the constitution of the tree and impair its longevity. These remarks are borne out by actual experience, as the districts in which the greatest losses have taken place have irregular rainfalls, whereas in those districts where the rainfall is fairly regular there have been practically no losses, even of trees that are much older than the majority of those that have died out where the rainfall is not so evenly distributed throughout the year.

I am therefore of the opinion that one of the most important steps towards increasing the longevity of citrus trees is the maintenance of a sufficient supply of moisture in the soil at all times to permit of the proper and regular development of the tree. This, in districts where the rainfall is uncertain and irregular, can only be brought about by judicious irrigation, which must be given as soon as the trees show signs of the want of moisture, instead of putting it off, in the hope of rain coming, till they have become seriously injured. The main object is to maintain an even growth and to keep the tree in a healthy condition the whole time. I have, therefore, to advise that, where trees show signs of dying out, systematic irrigation, to provide a regular supply of moisture to the soil at all times when needed, be carried out

wherever practicable. Where water is not available, these growers will have to depend on thorough cultivation, which will enable the trees to stand moderately long dry spells without serious injury, but which will not stand the strain of a drought.

This irregularity in the growth of citrus trees is undoubtedly one of the causes of the trees dying, but it is not the only one, although its effect on the vitality of the tree may be such that it renders it unable to throw off or resist fungus diseases which always accompany the dying out of citrus trees. In other words, the irregularity of growth may be the prime factor that leads eventually to the death of the tree. If this is so, then the importance of maintaining even conditions of growth cannot be overestimated.

The overmanuing of the trees with highly stimulating fertilisers which has taken place in some orchards where there has been serious loss may also possibly account for such loss, as heavy manuring is apt to produce abnormal growth, and unless the manure has been applied at frequent intervals, the growth is irregular; and, as I have previously pointed out, irregularity in growth is conducive to the maturing of the constitution of the tree. Great care should therefore be taken in the use of such manures to see that the trees do not receive an overdose at one time and are lacking food at another; small and frequent applications are therefore preferable to heavy dressings at longer intervals.

Insufficient drainage, which frequently accounts for the dying of the roots of citrus trees, cannot be held responsible for the death of many of the trees, as they were growing in soil possessing perfect natural drainage, in which there would be no possibility of stagnant water accumulating round the roots, though it is probable that, in some instances, it has been a contributing factor, and where such is the case drainage would certainly prove beneficial.

In nearly every instance in which the trees have died there has been more or less gumming—sometimes of the branches and sometimes of the main trunk at its junction with or near the soil, and very frequently both forms of gumming are met with. Usually the roots are badly affected and are killed outright, but in other cases the roots, or at any rate a part of them, are perfectly healthy, and all of the tree above the ground is dead.

In addition to the general advice I have given regarding the importance of maintaining an even condition of growth and of protecting the trees from sudden changes, I am including herein an extract from the fifth edition of my pamphlet on "Citrus Culture" descriptive of the diseases which are always more or less closely connected with the dying of citrus trees, as well as the treatment recommended, as follows:—

WITHER-TIP, DIE-BACK, OR TWIG BLIGHT.

(*Phoma omnivora*), McAlpine.

"This disease, which must not be confounded with the die-back of citrus trees in the United States, is, I am sorry to say, spreading in this State, and has already caused considerable loss. It is an extremely

complex disease, as it takes on many forms and attacks every part of the tree both above and below ground.

"It produces such varied results that were it not clearly shown by microscopical investigation that the damage is due to one and the same fungus in different stages of its development, one would naturally be led to think that instead of one there were several diseases present. As its name infers, this fungus in one state of development attacks the tips of the twigs which, when attacked, die from the top downwards. The affected twigs are covered with slightly raised irregular-shaped, greyish blotches which are conspicuous on the green bark, and soon kill the twig. The leaves show greyish patches which frequently rot away leaving ragged holes, or the edges or tops of the leaves may be destroyed in a similar manner.

"The fruit is covered by brownish or blackish scaly or scurfy patches somewhat similar in appearance to the well-known scab that is common on rough lemons.

"The roots are also affected and die back from the tips until the whole root system is killed (root rot).

"The mycilium (tissue) of this fungus can be found in all parts of the tree, but in the greatest quantity in the growing layer of tissue immediately underlying the back, and I am of the opinion that it will eventually be found to be one of the primary causes of gumming. Further careful investigation is, however, necessary before it is possible to arrive at a definite conclusion, and in the meantime the following treatment is recommended:—

1st—Systematic pruning to remove all dead and superfluous wood, which should be gathered and burnt.

2nd—Spraying the trees with the lime sulphur spray (F) or sulphide of sulphur wash (D); the former by preference.

3rd—The free use of the knife where gum appears and the sterilisation of the wound with carbolic acid: One part crude acid to one part water, or painting the wound with strong solutions of D or F.

4th—The application of from 2 to 4 lb. of lime, or from ½ lb. to 1 lb. of sulphate of iron (green copperas) to the roots.

5th—The sterilisation of all pruning tools by dipping them in a 5 per cent. solution of a 40 per cent. solution of formaline (one fluid ounce of formaline in one pint of water), as the disease is easily carried from a diseased tree to a healthy one by means of the pruning tools. A little care exercised in this respect will do much to check the spread of this disease, and as it entails very little extra trouble or expense it should be adopted by every fruitgrower.

"As already stated, this disease is of a very complex nature and to make it even more so, the fungus *Phoma omnivora* is frequently accompanied by other fungi belonging to Spp. of *Fusarium* and *Coniothecium*. The remedies suggested for the treatment of wither-tip are

those that are likely to prove efficacious in the case of the other fungi, so that no special treatment other than that recommended is needed.

"In addition to the fungi which are always found in connection with wither-tip, la grima (the gumming of the branches, mal di goma (foot or collar rot) and root rot, there are several others which are found on both the large and small branches usually in the form of grey or brownish patches, rough, scabby, or cankerous growths, or of cobweb-like, whitish filaments. The latter rapidly kills the bark and limb, as its mycilium travels along the cambium layer and destroys its vitality.

"If not treated, this fungus soon kills the limb on which it makes its appearance, and not only the limb but sometimes the whole tree. Spraying with the lime-sulphur wash or Bordeaux Mixture in the early stages is a certain cure for these diseases, but before the spraying is done all dead and superfluous wood should be cut away and the centre of the tree systematically pruned out so as to admit plenty of air and to facilitate spraying.

"If the fungi attacking the bark have already commenced to kill the limb, or if they are accompanied by gumming or by a yellow discolouration of the inner bark which exudes a yellowish viscid fluid, then the knife must be freely used. All diseased bark and tissue must be cut away till healthy wood is met with, and the wound must be treated with a disinfectant as already recommended, as must also all tools that have been used.

FUNGI ATTACKING THE ROOTS.

"The treatment for collar rot or mal di goma should start as soon as ever the presence of the disease is detected, as, if neglected, the fungus rapidly girdles the tree, which dies the same as if it had been ringbarked. The first external indication of the presence of this disease is frequently a small spot of gum at or near the surface of the ground, and when this is seen no time should be lost, but the knife should be freely used and all diseased bark and tissue cut away and the wound sterilised. If this is done in time the tree will be saved, otherwise there is every chance of its being killed.

"In addition to the root rot which starts at the end of the roots and eventually kills the whole root system, the roots of citrus trees are sometimes attacked by root fungus (*Armillaria mellea*), the mycilium of which spreads from the decaying roots of the original trees grown on the land to the growing roots of the citrus trees, which become covered with a network of dark-coloured fibres which soon kill the tree. The remedy in this case is to bare the roots and apply either air-slaked lime or firmly powdered sulphate of iron to them. The application of common salt to the roots, a handful to 4 gallons of water, has also been found an effectual remedy. This fungus is not confined to citrus fruits, but attacks the roots of all kinds of fruit trees, hops, &c., and although it has not so far done any very great damage in this State it should always receive attention, as, if neglected, it will kill the tree sooner or later."

Forestry.

OUR FRIENDS THE TREES.

The importance of our forests cannot be too frequently and forcibly brought before the rising generation in the country districts. Some trees are comparatively quick growers; others require many years before coming to maturity. Unthinking people are apt to say: "What is the use of my planting trees? I shall never benefit by them." That may be so, but if our forefathers had acted (or failed to act) on that principle, whence would the vast quantities of timber, such as that of the "brave old oak," been obtained for the building of Great Britain's wooden walls—her ships in the days prior to the advent of the iron ship? Whence would we to-day obtain our great supplies of cork, if the Spanish people had allowed the cork oak to die out? And whence shall the future generation of Australians derive supplies of cedar, beech, eucalyptus trees, such as ironbark, gum, bloodwood, and of many valuable scrub timbers, many of which are being ruthlessly destroyed in the interests of agriculture?

It all depends on what is done now in the matter of reafforestation. No one is too old to plant a tree or trees on some portion of his land not required for cultivation purposes. There is a story of an old man in Devonshire who was planting out some walnut trees. On being asked why he was planting trees which would only produce fruit when his young children had grown into middle age, he replied: "When that time arrives, those children will bless the memory of the old man who left them a valuable legacy."

In the "Hawaiian Forester" for December, 1915, is published a very interesting address by Mr. C. S. Judd, Superintendent of Forestry, at Arbor Day Exercises, Pokuhaina School, Honolulu, which we commend to school teachers in Queensland. Mr. Judd said:—

"Do you know that the oldest living things in our world are trees? The giant sequoia trees of California, and their brothers, the redwoods, which we use here in these Islands for fence posts and water tanks, are the last survivors of a great family of trees which covered a large part of the western world in the past ages when strange and monstrous animals roamed the forest. When Solomon was building his temple about 2,915 years ago, if he had only known it and had had the proper ships, he could have used for the rafters of his temple the giant sequoia of the Sierra Nevada mountains instead of the firs and cedars of Lebanon. Even then, these noble trees, which now tower up into the sky to more than half the height of Punchbowl, were over a thousand years old.

"Aside from this interesting fact as to the age of trees, I want to point out why we regard the trees as our friends and why, for that reason, we celebrate this day by planting them.

"What did you sleep in last night? A wooden house.

"What did most of you sleep on last night? A wooden bed.

"What did you eat your breakfast on this morning? A wooden table.

"What did you sit in while you ate it? A wooden chair.

"What was used in cooking your breakfast? Wood, undoubtedly, in most cases.

"What was used in starting the fire in the stove? A wooden match.

"What was the newspaper which you read this morning made of? And the books which you study in this school? Mostly wood pulp.

"So you see that we must call the trees our friends if we simply consider their usefulness in supplying us with wood for these articles, without which we could not very well get along.

"And besides the value of trees in other countries for producing wood for our use here, let us see how useful are our own trees in these islands. Take the algaroba or kiawe tree alone, which was first brought to these islands about 87 years ago and has multiplied and spread over many thousand acres, so that it is not only a benefit to ourselves, but also to the insects of the air and the beasts of the field. This tree not only supplies us with the wood which we need for cooking and the charcoal which heats our irons when our clothes are pressed, but produces the flowers which furnish pastures for the millions of bees which convert the nectar of the blossoms into honey which we eat on our bread and on our pancakes, and in the dry season when the grass in the pastures is brown and dead it drops the sweet yellow pods which are eagerly devoured by the cattle, horses, and pigs if they can get them before they are picked up by the little children, who take them to the mills, where they are ground up into meal to be fed to the animals later on. And how much more pleasant are parts of our islands on account of the shade which the algaroba trees produce.

"When my father was a little boy and rode from Nuuanu to school at Punahou he had to ride around the makai side of Punchbowl and then across the large, open, wind-swept plains which are now crossed by Beretania street and which in those days had scarcely a tree or a house on them. One day his horse ran away with him and he let him run across this vast, treeless stretch of country, part of which is now Thomas Square, and out beyond until he came to a grassy place near a spring. Here he selected a soft spot and slid out from the saddle safely on to the ground.

"How different these plains are to-day! They are not only thickly covered with streets and houses, but the innumerable trees that have been planted there have changed them from bare, wind-swept flats to

a comfortable residence district, and when you look down upon them from Punchbowl they look like a huge forest and half of the houses cannot be seen on account of the trees.

"We plant trees in the city not only for the ornament which their foliage and flowers produce, and which please the eye, but also for the shade which their spreading branches afford and which protect us from the sun. When you wait on the corner for a street car on a hot day, how pleasant it is to seek the shade of a spreading monkey-pod or royal poinciana, and when a sudden shower comes up, isn't it a tree that you run to for shelter?

"The value of trees for producing wood for a hundred different uses, for producing fuel, and shade and shelter, we unconsciously accept because they minister to our needs and physical comfort in a direct and tangible manner, but there is another way in which the trees when growing together in a community, which we call a forest, are equally as useful, only we do not realize it because their usefulness is exerted in an indirect manner. It is the effect of the trees in the forest on our water supply to which I refer.

"When you drink your glass of clear water you should thank the forests on the mountains not only for offering you refreshing water, but water whenever you are thirsty and want it. If there were no forests on the mountains back of Honolulu, when the rain fell it would rush down the slopes, into the valleys, and out to sea as a mass of dirty water, and in a few days it would all be done. But with our forests on the mountains it is different. The rain strikes the leaves and tree branches and then falls on to the ferns and bushes and finally on to the ground covered with fallen leaves and moss. All of this retards the run-off of the rain water, and the litter on the ground acts as a sponge from which the water oozes out slowly. Water falling on a galvanised iron or shingle roof runs right off into the gutters, but if you covered that roof with moss or gunny sacks you would find that the water would run off much less at a time and would continue for a much longer period. So it is with a mountain-side covered with forest trees. The run-off from the rain is much slower and lasts for a longer time than if there were no forest cover.

"Without the forests on our mountains, our water supply would be much less and of poorer quality, and there would be times when there wouldn't be any water at all. Without our forests, there would not be enough water for irrigating the sugar cane fields, and this industry would not be the mainstay of our islands; there would be little or no rice cultivation, and most of our taro patches would be dry. The freshets would dash down from the mountains a great mass of rocks and rubbish, you would seldom have any clear drinking water, and these islands would be a very unpleasant place in which to live.

"Because the people of China long ago were careless in cutting down most of their forests, to-day in that country there are in the rainy season terrible floods which inundate and destroy the lands and kill many of the people.

"The influence of forests on streams alone, besides preventing floods and drought, therefore, makes the raising of crops possible, and without crops we could not live.

"As man is the most highly organised portion of the animal world, so is the forest the most highly organised portion of the vegetable world. The trees, of which the forest is composed, have functions similar to the workings of the human body. Their roots take water and mineral substances from the soil, which is pumped up to the leaves, which work it over with the aid of the sun and combine it with carbon from the carbonic acid gas in the air, into food which is sent to the living parts in the roots, trunk, and crown to assist in the growth of the tree. This food is digested in the leaves of the tree just as food is digested in the human body.

"So trees may be considered to be almost human. At least they are our friends, as I have told you already, because of what they do for us and supply us with, and they should therefore be treated by us as kind and useful friends. Don't throw sticks and stones up into the trees or break off the branches, and when the young trees which you have planted droop in the hot sun, revive them with a pail of water.

"Just give the trees a start, and they will grow while you are doing other things, and as you get older they will come to be a real benefit and delight and a source of great enjoyment to you."

A POSSIBLE NEW SOURCE OF POTASH.

Judging by the following paragraph which appeared in the "Louisiana Planter" of 4th March, there would appear to be grounds for hope that the world will not be dependent on Stassfurt for supplies of potash manures during or after the war:—

"And now New Mexico is going to beat Germany, at least so the Press despatches seem to indicate. In the Panhandle of Texas, in Oklahoma and New Mexico, Permian red beds have been discovered containing inexhaustible quantities of potash that will make every cane and beet field blossom with abundance, and the land will drop fatness to astonish all planters. At Lesbia, New Mexico, large salt beds were penetrated at a depth of several hundred feet, and they found peculiar red shale and sandstone with a potash-bearing deposit, and that the dip was close to the earth's surface. In 1913, the United States imported 12,000,000 dollars' worth of kali from Germany, and if New Mexico will come forward and cast a hedge about America, guaranteeing that all this money will stay here, generations to come will rise and call her blessed. Here's hoping that the faith has decent substance behind it."

Tropical Industries.

THE INFLUENCE OF RAINFALL AND THE NON-BURNING OF TRASH ON THE ABUNDANCE OF DIATRAEA SACCHARALIS.

The following notes, which may be interesting to sugar-growers in Queensland, are taken from a pamphlet issued by the Board of Commissioners of Agriculture, Rio Pedras, Porto Rico, written by Geo. N. Wolcott, Entomologist, Insular Experiment Station, Rio Pedras:—

The most important insect injurious to sugar cane in the Western Hemisphere is the smaller moth stalk-borer, *Diatraea saccharalis* Fabr., which occurs in abundance in the southern United States, Mexico, Cuba, Jamaica, Santo Domingo, Porto Rico, St. Kitts, Barbados, Trinidad, Demerara, and Argentina, besides other islands and countries of lesser importance in sugar production.

The writer of this article has personally visited all of these countries except Mexico, Santo Domingo, and Argentina, making a special study of cane insects and their parasites, and has been impressed by the notable difference in abundance of *Diatraea* in various places. In an attempt to obtain definite data as to the comparative abundance of *Diatraea,* a form of recording notes adapted from that first used by Mr. W. Dwight Pierce in recording the abundance of the boll weevil of cotton, and later perfected for use with insects of sugar cane by Mr. T. E. Holloway, in charge sugar-cane investigations in the United States, has been used. It has been considered that a fair approximation of the conditions existing throughout a field will be obtained if four groups of twenty-five stalks each in various parts of the field are examined. If a considerable number of canefields are examined in one locality, it is considered that an average of the results obtained from such examinations will be a fair approximation of the conditions existing at that locality. Because *Diatraea* is by far the most generally important pest of cane, and its injury can be statistically recorded with comparative ease, much more data is available recording its abundance than of other cane insects. Mr. Holloway has records covering several years for many localities in Louisiana, Texas, and Florida, and the writer has made observations in many localities in Cuba and Jamaica last winter, and this year has quite thoroughly covered the cane-producing sections of Porto Rico, besides having made less extensive observations in Demerara, Trinidad, and Barbados two years ago.

It is from a consideration of the careful observations made in Porto Rico during the present grinding season, confirmed by those made in other countries, that a constant relation was first noted between the abundance of *Diatraea* and the amount of rainfall. Working along similar lines, Mr. Holloway has contended ("Louisiana Planter," 19th December, 1914) that the abundance of *Diatraea* depends in large part

upon the scarcity of the cosmopolitan and omnipresent egg parasite of the borer, *Trichogramma minutum*. Field experiments in Texas and Louisiana, carried on for two years by Mr. Holloway, have quite effectually demonstrated that the burning of the cane trash (tops and leaves) after the cane is harvested destroys large numbers of *Trichogramma*, as is evidenced by a larger number of cane stalks injured by *Diatraea* in the succeeding crop than in check fields where the trash is not burned.

It seemed very important to discover whether the effect of burning or not burning the trash was as important in Porto Rico as in Louisiana, and many observations were made in all parts of the island to determine this point. For the purpose of making a comparison, it would be necessary for a field where the trash had been burned and one where it had not been burned to be adjacent, and the treatment each received to be practically the same, aside from the difference regarding the treatment of the trash. Only one such instance was found—at Central Aguirre, Hacienda Aguirre, Tablón No. 10, a field of first-ratoon Crystalina cane beside the Ponce and Guayama Railroad, where the trash on about half the field had been accidentally burned by a fire started by sparks from a railroad engine, and on the other part of the field the trash had not been burned. In the unburned area only 22 per cent. of the cane was infested with *Diatraea*, but in the burned area 75 per cent. was infested. This was only one field, and it became increasingly apparent as more observations were made, that such conditions would seldom be found, as it is characteristic of the north coast not to burn the trash, and equally characteristic of the south coast to burn the trash. Although the fields on the south side of the island showed a much greater abundance of *Diatraea* than those on the north side, it was felt that so many other conditions were different that these in large part might be responsible for the marked difference.

For instance, at Central Los Caños, near Arecibo, Mr. Childs, the administrator, has been very careful not to burn trash except where necessary, yet the cane there is more heavily infested by *Diatraea* than at some other places where less care is exercised in preventing the accidental burning of the trash, but where rainfall is more abundant. The writer's recollection of the heavily-infested cane in Barbados, where trash is never burned, but because of deficient rainfall is carefully placed over the soil around the young cane to conserve all possible moisture, and where *Trichogramma* is present in considerable abundance, indicated that the non-burning of trash could not be the only control factor. At Central Constancia, near Cienfuegos, Cuba, the cane around the mill is almost entirely free from borer injury, but at Horquita, an *hacienda* of the mill 17 miles away, the cane is heavily infested. The only obvious difference is that at Horquita the rainfall is deficient and the cane is grown under irrigation. Although, in a general way, trash is not burned in Cuba, no particular care is exercised in preventing its accidental burning, and the control of *Diatraea* by *Trichogramma* can hardly be sufficient explanation of the comparatively slight amount of injury caused by the borer. In the cane-growing sections of Havana, Matanzas, and Santa Clara provinces, the annual rainfall averages from

over 50 in. to nearly 90 in.—or more than on the north side of Porto Rico—and the infestation by *Diatraea* averages about 10 per cent. In Camagüey and Oriente provinces the annual rainfall is from 30 in. to 50 in., and at Central Chaparra, where the annual rainfall is 33 in., the infestation by borer is 40 per cent. In Trinidad the rainfall is more than ample, and *Diatraea* is third in importance as a cane pest.

In Jamaica cane insects are not abundant, but there is a very noticeable difference in abundance on the north and south sides. On the south side, *Diatraea* infests 15 to 30 per cent. of the stalks, but on the north side only a careful search will disclose borer injury. Conditions as regards burning trash are identical, as practically all the cane is ratooned, or planted in, for many years, and trash is never burned. On the south side it is kept as a soil mulch, as rainfall is usually insufficient and irrigation is used whenever the water is available, but on the north side, beside being grown in fertile valleys, cane is planted on such steep hillsides that its growth would be impossible without abundant rains at all seasons.

The physical conformation and climatic conditions of Jamaica and Porto Rico are quite similar, and it is to be expected that a similar scarcity of *Diatraea* on the north side and relative abundance on the south side would be found. This is well illustrated for Porto Rico by the accompanying map, which shows the percentages of infestation of cane by *Diatraea* in conjunction with the total annual rainfall in inches.

Total annual rainfall and average infestation of sugar-cane by *Diatraea saccharalis* at various localities in Porto Rico ; also infestation in fields where trash was burned and where trash was not burned.

Locality.	Inches of Rainfall 1914.	Percentage of Infestation, 1914-15.		
		Average of all Fields.	Fields where Trash was Burned.	Fields where Trash was not Burned.
Coloso	101	6 (8)	..	6 (8)
Añasco	95	5 (6)	..	5 (6)
Fajardo	76*	11 (15)	13 (6)	9 (9)
Manatí-Morovis	72	6 (9)	10 (2)	4 (7)
Canóvanas	70	11 (4)	..	11 (4)
Toa Baja	70	15 (8)	19 (4)	10 (4)
Río Piedras	66	17 (7)	..	17 (7)
Vega Baja	66	39 (9)	44 (5)	26 (4)
Caguas	58	6 (5)	..	6 (5)
Yabucoa	58	37 (5)	60 (2)	22 (3)
Arecibo	55	26 (16)	69 (1)	23 (15)
Juana Díaz	60	32 (9)	34 (8)	18 (1)
Guayama-Josefa	45	47 (4)	47 (4)	..
Aguirre	34	45 (7)	50 (5)	31 (2)
Potala	27	37 (9)	44 (6)	24 (3)
Ponce	25	48 (8)	48 (8)	..
Destino-Salinas	23	64 (5)	77 (3)	44 (2)
Guayanilla	24	76 (5)	76 (5)	..
Santa Isabel	22	72 (4)	78 (3)	46 (1)
Guánica	21	66 (28)	68 (24)	31 (4)

NOTE.—Figures in ( ) after percentages indicate numbers of fields examined.

* Average of rainfall of *haciendas* ; not of the town.

for 1914, and when such data are arranged in statistic form (table) they are shown to be most strikingly inversely proportional. One of the most striking things brought out by this data is the remarkable difference in infestation on the south coast when in an occasional field the trash is not burned, and on the north cost when the trash is burned. In most cases the difference amounts to nearly 100 per cent. higher infestation by borer in fields where the trash has been burned than in fields where it was not burned.

That rainfall affects the abundance of the smaller moth borer is of scientific interest, but apparently no economic application can be made of this fact. But it would seem to be quite possible for planters to take advantage of the relation which has been found to exist between trash burning and borer infestation, and stop burning trash.

If a heavy yielding field is to be replanted, it is usually so densely covered with trash that this must be burned before it can be ploughed. If the field is to be ratooned, however, the trash can be raked into alternate rows, at an expense generally averaging about 75 cents per acre, where it will not be in the way of the young shoots, and the other rows may be cultivated or have irrigation water run through them. If the cane is grown in banks, the trash can be raked up on top of the bank between the cane stools, where it will not clog the drainage ditches. On the hilly land and the heavy clay soils in Porto Rico, which include most of the best cane lands on the north side of the island, and on the swamp or *poyal* lands along the seacoast of all sides of the island, thorough preparation of the soil for replanting is difficult and expensive, and it is a common practice to ratoon cane as long as the yield is satisfactory. Thus, on what is by far the largest part of the land devoted to cane in Porto Rico, for the one and usually two or more years when the cane is ratooned the trash *need not* and *should not* be burned.

On the light, sandy, and easily worked soils of the south side of the island, cane is replanted each year and very seldom ratooned. These are usually fertile and valuable lands, often producing heavy tonnages of cane. The trash is abundant and almost invariably is burned each year, and as a result often *all* the stalks of cane in these fields are infested and sometimes badly injured by the borer. Because these lands are planted each year, Otaheite (Caña Blanca) is the favourite variety of cane, as it gives a good yield the first year, and, as it is not ratooned, its usual inability to give a good ratoon crop does not matter. Other cane varieties, such as D 117, B 3412. and B 3922, will usually give as good or better returns than Otaheite the first year and ratoon well the second year, thus effecting a saving of the cost of fitting and replanting, and requiring less water to start the ratoons than plant cane. The wider use of these or similar heavy yielding and good ratooning varieties can be unequivocally recommended, and if the trash is not burned for the first ratoon, this will have a very marked effect in reducing the amount of borer damage.

Percentage of Infestation by Sugar-Cane Moth Stalk-Borer (*Diatraea saccharalis*.)
11
11
37
6
17
15
39
6
26
32
48
72
64
45
47
76
66
6
5
Total Annual Rainfall, 1914.
SCALE OF SHADES.—In Inches
Less than 30
30 to 50
50 to 70
70 to 90
More than 90

Although conditions as regards insect injury are very bad on the south coast of Porto Rico, in large part due to the systematic burning of trash, it is probable that *Diatraea* will also each year become more abundant on the north coast at places where it has been customary to burn trash, unless this practice is discontinued. Conditions in Louisiana may be cited as an example. There, with an abundance of rainfall (53 in. at Melville as a minimum and 97 in. at Donaldsonville as a maximum in 1913) and a severe winter which the borer must survive, one would expect the injury by borer to be slight. For generations, however, the cane trash has been systematically burned, and the infestation by *Diatraea* in sections where cane is most extensively grown is very high, averaging 70 per cent. Although other factors may have helped to produce this condition, the fact that the heavy rainfall would tend to keep down infestation clearly indicates that to the burning of trash is due the great numbers of this pest. The remedy is obvious.

It is comparatively easy to demonstrate the effect of an abundance of rainfall in lessening the numbers of *Diatraea,* but much more difficult to satisfactorily account for this effect. Last winter, in Cuba, it was observed that considerable numbers of borer larvæ were killed in young cane by the more rapid growth of the central shoot of a cane plant than of the outer leaves. Also, larvæ were found which had been drowned in a mixture of water and decaying cane juices which had collected in their tunnels after rains. To avoid danger from these causes, many larvæ were found living outside the shoot, where they are exposed to the attacks of predators and parasites. Tachinid flies are important parasites of *Diatraea* larvæ in Cuba and possibly destroy 25 per cent. of the larvæ.

In older cane the borer larvæ spend practically all their existence within the stalk of the cane, and only occasionally do they crawl out. It may be considered that this stage of the insect is practically unaffected by rainfall. The eggs of *Diatraea* are deposited on the leaves of the cane, and when the young larvæ hatch, a considerable interval elapses while they crawl about on the cane before they enter the stalk, or the midrib of the leaf. It is quite probable that this is one of the most crucial periods in its life history, and that many newly-hatched larvæ fail to enter the cane before they are washed off by the rain. At this time, also, they would fall an easy prey to predators, especially *hormiga brava, Solenopsis geminata.* No theories have been advanced as to how rainfall may affect the adult moths, or the deposition of eggs.

SUMMARY.

The abundance of the smaller moth borer, *Diatraea saccharalis,* the most important pest of cane in the New World, depends upon two factors—rainfall and the burning of trash. Rainfall cannot be controlled, but in many cases in Porto Rico, trash is needlessly burned. Burning trash increases the abundance of the borer 100 per cent. DON'T BURN THE CANE TRASH.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

BY J. F. BAILEY AND C. T. WHITE.

No. 3.

KHAKI WEED.

ALTERNANTHERA ACHYRANTHA, R.Br.

During the past few years specimens of the South American plant (*Alternanthera achyrantha*) have been sent in from various parts of the State with reports as to its troublesome character.

This plant was introduced into South Africa with fodder from Argentina at the time of the last Boer war, and has since been declared a noxious weed in quite a number of districts in that country. From South Africa it found its way to New South Wales, and then to this State. It is known in South Africa and New South Wales as Khaki Weed, owing to its colour, according to J. H. Maiden, Government Botanist of New South Wales, and for the reason of its war association, according to N. S. Pillans, in the "Agricultural Journal" of the Cape of Good Hope, for September, 1910. In the latter it states that "opinions assert its noxious qualities owing to the spiny parts of the clusters of little flowers becoming entangled in sheep's wool. Since the plant grows prostrate on the ground, it is presumably when the animals lie down that the trouble occurs." In some quarters it has been suggested that the plant be declared a noxious weed in this State, and we are inclined to agree that it deserves a place on the list; for, although it belongs to a family which furnishes wholesome feed, its value in this direction is not commensurate with its troublesome character.

A year or two ago it was noticed to be very abundant on the footpaths near the Boonah Railway Station, and complaints have been made by schoolmasters in this and the Esk districts that the spines are very troublesome to the feet of the school children. Among other localities where the weed has made its appearance are Charters Towers, Springsure, Booyal, Bundanba, Brisbane and suburbs, and Rockhampton. Alderman Wilkinson, in writing about it from the latter place, in 1912, stated: "This burr creeper has made its appearance in this district. It is exceedingly aggressive, covering a large tract of ground rapidly, and giving nothing else a chance in its vicinity. It seems quite at home on the ordinary macadamised road." Mr. E .H. T. Plant, when sending specimens from Charters Towers, in 1913, stated: "This burr weed has lately made its appearance in this place. . . . It appears to spread rapidly, and may become a serious nuisance if left alone."

The plant is of prostrate habit, with numerous slender stems forming a mat-like mass. The leaves are usually broadly ovate with a small point. They are from ½ in. to 1½ in. long, with a corresponding

width up to 1 inch. Clusters of spiny flower-heads are in the axils of the leaves. The fruit is a small bladder containing a minute brownish seed.

Like many plants of similar growth, the only successful mode of eradication is to destroy the plants previous to the seeding stage. Where the plants are growing thickly together, this might be done by spraying with any of the weed-killing preparations obtainable at the seed shops.

PLATE 17.—KHAKI WEED.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF MARCH, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Madam Melba	Holstein	28 Oct, 1915	945	4·4	48·93	
Lady Melba	,, ...	17 Dec. ,,	1,052	3·9	48·15	
Rosebud II.	Ayrshire	11 Oct. ,,	509	5·8	34·94	
Miss Bell ...	Jersey	2 July ,,	507	5·8	34·81	
Gretchen ...	Holstein	16 Aug. ,,	546	5·2	33·52	
Sweet Meadows	Jersey	28 Sept. ,,	462	6·1	33·38	
Miss Melba	Holstein	30 Sept. ,,	723	3·7	31·34	
Lady Margaret	Ayrshire	14 Oct. ,,	547	4·8	30·96	
Miss Lark ...	,, ...	8 Sept. ,,	441	5·8	30·26	
Bluebell ...	Jersey	20 June ,,	456	5·5	29·66	
Belinda ...	Ayrshire	27 Feb., 1916	567	4·4	29·36	
Lennie ...	,, ...	23 July, 1915	500	4·9	28·91	
Twylish's Maid	Jersey	22 Oct. ,,	404	5·8	27·73	
Burton's Lady	Shorthorn... ...	13 Jan., 1916	678	3·4	26·93	
Miss Edition	Jersey	27 Sept., 1915	411	5·5	26·73	
Violette's Peer's Girl	,, ...	8 Dec. ,,	477	4·7	26·41	
Jeannie ...	Ayrshire	1 Nov. ,,	469	4·5	24·85	
Dolly ...	Shorthorn... ...	23 Jan., 1916	473	4·4	24·49	
Bella ...	Ayrshire	25 Dec., 1915	496	4·2	24.47	
Daisy ...	Holstein	23 Nov. ,,	571	3·6	24·09	
Iron Plate ...	Jersey	20 Jan., 1916	408	5·0	24·07	
Lady Annette	Ayrshire	14 Nov., 1915	437	4·6	23·68	
Pauline ...	Shorthorn... ...	17 Sept. ,,	466	4·3	23·57	
Windyhill Davidina	Ayrshire	20 Aug. ,,	526	3·8	23·43	
Noble Dot ...	Jersey	2 May ,,	308	6·4	23·37	
Burton's Lily	Shorthorn... ...	13 Jan., 1916	518	3·8	23·08	
Lady Lil ..	Jersey	27 June, 1915	346	5·6	22·91	
Lilia ...	Ayrshire	19 Aug. ,,	509	3·8	22·68	
Constancy ...	,, ...	24 Nov. ,,	473	4·0	22·21	
Glen ..	Shorthorn... ...	31 Oct. ,,	399	4·7	22·09	
Nellie II. ...	,, ...	20 July, 1914	431	4·3	21·80	
Special Edition	Jersey	1 Nov., 1915	360	5·1	21·68	
Miss Jean ...	Ayrshire	5 Nov. ,,	449	4·1	21·62	
Mischief ...	,, ...	27 Sept. ,,	504	3·6	21·32	
Lucinda ...	,, ...	14 Oct. ,,	477	3·8	21·24	
Lady Twylish	Jersey	5 June ,,	500	3·6	21·10	
Silver Nell...	Shorthorn... ...	16 Aug. ,,	394	4·4	20·40	
Lady Dorset	Ayrshire	10 Aug. ,,	418	4·1	20·13	
Dottie ..	Shorthorn... ...	27 Nov. ,,	452	3·8	20·12	

The above cows were fed on natural pasture only.

Entomology.

COMBATING THE CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist to the Bureau:—

Research work relating to the control of the grub stage of our cane beetle is now in hand. A number of experiments in this connection were carried out last season, but being of a preliminary character were not made known.

The study of larvicides has been continued, as although this form of control is of secondary importance there are times when limited areas of grossly infested soil may be profitably treated with insecticidal solutions. The following chemicals were found to exhibit apparent larvicidal effects worthy of mention:—

1. Creolin (1 pint to 50 gallons water) applied to grubs in cages of soil at the laboratory proved fatal to 100 per cent. Its action was rapid, larvæ being partially decomposed twenty-four hours after treatment. The price, however, is prohibitive, as it would cost about a farthing to treat a single stool of cane with 2½ gallons of the above solution. Five quarts (1-50 formula) were applied to the roots of a stool at the laboratory without injuriously affecting the foliage.

2. Cyanide of potassium (1 lb. to 200 gallons water) destroyed 100 per cent. of larvæ in cages of soil, and also in the open when applied to the roots of a stool under which a dozen grubs had been placed and allowed to work for four hours before treatment. A cane plant 2 ft. high watered with 8 quarts of this solution showed slight signs of wilting of the foliage after twenty-four hours, but regained its normal appearance a week or so later.

The Mamelle method of applying cyanide by injection was tested in a preliminary way with satisfactory results. In one of these tests twenty grubs were placed a few inches apart in a trench about 4 in. deep around a flourishing stool of plant cane, and the earth replaced but not watered. On the following day two ½-oz. injections of a solution prepared by dissolving 7 oz. potassium cyanide in 1 quart of water were administered on each side of the stool, nearly under the centre of same. When examined five days later two living and thirteen dead grubs were found within a radius of 9 in. from centre of stool—the former embedded in hard subsoil below the level of injections—and four living specimens at a distance of 1 ft. from the plant. The injected solution was still decomposing, and diffused a strong odour of potassium cyanide. The above experiment was made last year, but fuller investigations were postponed in view of the high

price of this chemical. I may mention that the Mamelle process was first made known to our growers by Mr. Tryon in 1910 ("Australian Sugar Journal," volume II., page 88), who states:—"This treatment, allowing for about 50 cubic centimetres per plant, would work out at about 40 lb. of potassium cyanide per acre. And in estimating the cost a set-off must be made on account of the value as a fertiliser of the potash added to the soil through the procedure."

3. Borax (1 lb. to 3 gallons water) proved to be an efficient larvicide, but is too expensive for general purposes.

4. Creosote (8 oz. to 5 gallons water) emulsified with "Sunlight Soap" gave fair results. Control larvæ in each of the foregoing experiments remained normal throughout.

Solutions of the following chemicals applied to soil in cages had no perceptible effect on larvæ of the mealy-back cane-beetle:—Saltpetre (1 lb. to 3 gallons water), barium chloride (1 lb. to 3 gallons water), and hellebore (1 lb. to 12 gallons water). These negative results are somewhat remarkable, since both saltpetre and hellebore are known to possess decided larvicidal properties. Our stock of the latter chemical, however, was procured in Victoria more than a year ago, and may have deteriorated.

Experimentation regarding the control of the grub stage by means of stomach poisons was commenced about the 15th instant. Initial work in this connection during last season (not yet published) has served to direct present research into promising channels, and I may say that this branch of control is progressing favourably.

NEW FRUITGROWERS' ASSOCIATION.

At a large and enthusiastic meeting of fruitgrowers and intending fruitgrowers, held at the Town Hall, Gympie, on 9th March last, it was unanimously resolved to form a Gympie and District Fruitgrowers' Association, having for its objects—

To meet and exchange ideas and experiences; to arrange and attend to visits by Government Instructors; to deal with shipping and transport of fruit to markets; to improve present methods of sale and marketing; to combine in placing requirements and interests before Government departments; to affiliate with other similar associations for the general good of fruitgrowers. The fee for membership is only 5s. per annum. There is no doubt that this Association will be a great benefit to fruitgrowers and intending fruitgrowers in the extensive Gympie district, and it may be confidently relied upon that with the zeal and activity characteristic of the rural population of the district the Association will become a powerful factor in promoting the interests not only of their own district but also of other fruit-growing centres. The secretary is Mr. H. Sedgman, Mary street, Gympie.

Science.

THE PREVENTION AND TREATMENT OF BLACKWATER FEVER.

The "Rhodesian Agricultural Journal" some time ago published, for the benefit of farmers and settlers, a paper on the subject of Blackwater Fever, by A. M. Fleming, C.M.G., M.B., F.R.C.S. (Edin.), D.Ph. (Camb.), then Medical Director for Southern Rhodesia.

Seeing that in addition to the settled white population of Papua, there are also many Australian soldiers in different parts of New Guinea, and in the Bismarck Archipelago, in all of which islands there are vast, dense scrubs where the fever-carrying anophele mosquito breeds, and ordinary malaria and blackwater fever are of frequent occurrence, it may often happen that men are attacked by these ailments in localities where no medical man is available. As this Journal circulates in Papua and in other islands adjacent, we give the full text of Dr. Fleming's paper, in the hope that it may prove of service to our friends who are engaged in the arduous duty of guarding our recently acquired possessions there:—

"At the present stage of our knowledge, blackwater fever may be considered to be the result of malarial infection, which has been imperfectly treated. The vast majority of cases show a history of recurrent attacks of malaria, which have been made light of, the patient having possibly, whilst the symptoms were acute, taken a few doses of quinine, and then not bothered further.

"A great deal has been written, and more talked about, the dangers of taking quinine, and how it is supposed to bring on blackwater fever, and I would like, at the start, to disabuse the mind of the public on this point.

"The theory—for it still remains a theory—that quinine is responsible for the appearance of blackwater fever is by no means a new one, and, lately, has received the support of Professor Koch. The worst of it is that Professor Koch's arguments and conclusions have never been properly understood by the public, and I have often been told by the ignorant that, Professor Koch having proved that quinine caused blackwater fever, to take quinine for malaria was merely courting disaster.

"Now, I have had the pleasure of discussing this very point with Professor Koch himself, and can with certainty affirm that he never said anything of the sort. What Professor Koch did say was that in his opinion persons who were infected with malaria which had been imperfectly treated with quinine, became after a time predisposed to blackwater fever, and when in that condition a sudden dose of quinine was often the determining factor in bringing about an attack. He urged, therefore, that all persons infected with malaria should take full doses

of quinine, and continue the treatment for some time afterwards; in other words, so habituate themselves to quinine that they never reached the stage of chronic malaria, which predisposed to an attack of blackwater fever. A very different statement to the former, as you can see.

"It is still a disputed point whether quinine is or is not one of the causal factors in determining an outbreak of blackwater fever in persons predisposed to it from environment and previous malarial infection, and it is a question upon which much controversy still rages, and at the same time it would be quite out of place to discuss this here; it is sufficient to say that, if all cases of malaria were properly treated from the start with quinine regularly administered, and the administration continued in preventative doses for some weeks or months afterwards, blackwater fever would be a much rarer disease amongst us, if not eradicated altogether.

"In my experience of many thousands of cases of malaria, I have never seen blackwater fever occur in a person who was thoroughly cinchonised—that is, so far under the influence of quinine that his ears rung, and he was deaf from it. It is, however, not the cause of blackwater fever I want to write about so much as how to recognise it and treat it, when medical aid is not at once available.

"There is no difficulty in the recognition. It commences, as a rule, just as any ordinary attack of malaria, though the initial rigor (or shivering attack) is, as a rule, more severe and prolonged. Shortly afterwards the patient notices that on passing water, his urine looks jet black. If put in a glass vessel and held to the light, however, it is seen to be really a deep rich port wine colour. At the same time he becomes rapidly jaundiced all over, this being specially marked in the whites of the eyes.

"At the very first onset the patient should be put to bed, and the bowels opened with a sharp purge, preferably five grains of calomel. The diet should be entirely liquid, of a bland nature, warm milk and barley water being most suitable, if obtainable. The patient must be kept warm, and the greatest care taken to avoid chills and draughts.

"If vomiting is severe—and it often is, especially at the outset—the stomach can be washed out by giving large drinks of hot water with a few grains of bicarbonate of soda dissolved in each tumbler. Nourishment, in this case, should only be given in small quantities (few spoonfuls at a time) frequently repeated. Stimulants are, as a rule, unnecessary and undesirable, but if found necessary, probably the best is a little weak brandy and soda.

"As syncope or heart failure is not an infrequent complication, the patient must on no account leave his bed for any purpose whatsoever,

and must not even be allowed to sit up. If suppression—that is, stoppage of the flow of urine—threatens, warm applications such as linseed poultices, cloths wrung out of hot water, &c., should be applied to the back, in the region of the kidneys.

"As far as drug treatment is concerned, we have unfortunately no specific in blackwater fever, as quinine is in malarial fever. In British Central Africa, where blackwater is well known, good results are reported from a modification of what is known as 'Sternberg's Mixture for Yellow Fever.' This consists of thirty drops of liquor hydrargyri perchloridi and ten grains of bicarbonate of soda, taken in water every two hours for the first twenty-four hours, and subsequently every four hours till the urine clears.

"Others, again, have obtained good results from methyl arsenate of soda (arrhenal) in half-grain doses dissolved in sterilised water and injected hypodermically every six hours till the urine clears. As this, however, requires the requisite skill for the administration of the hypodermic injection, it can only be given by a medical man or trained nurse.

"The administration of quinine in large doses is advocated by some. This, however, should not be attempted, except where a doctor is in attendance and on his advice.

"Blackwater fever is a disease which will repay, more almost than any other, careful and intelligent nursing, and it is in this direction that the uninitiated can do most to alleviate the suffering of the patient and avert disaster, rather than by the administration of powerful drugs, concerning the action of which they know nothing, and the effects of which they cannot watch. The strictest attention must at all times be paid to the warmth of the patients, the diet, and the absence of all excitement or movement, and he or she should never be left long alone.

"After the attack and during convalescence, the anæmia and consequent debility is the most marked symptom, and the patient should not leave his bed till at least a fortnight has elapsed after the temperature has fallen and the urine completely cleared. During this time he should be fed upon milk, eggs, jellies, strong soups, &c. An iron tonic should at the same time be given.

"Persons who have once had blackwater fever are exceedingly prone to further attacks, if reinfected with malaria, so they should accustom themselves to taking quinine in preventative doses for a long time afterwards. Sir Patrick Manson has laid it down as a maxim that all those who have had blackwater fever should take five grains of quinine daily whilst living in a malarial district, and for at least six months after leaving it."

General Notes.

A NEW USE FOR SUNFLOWERS.

Amongst the various products of the sunflower, such as poultry food, oil, oil-cake, and fodder, there is one which appears to have only lately been discovered, and that is the value of the pith of the stalk.

The sunflower is cultivated to a considerable extent in Central Russia, where every part of the plant is put to certain economic uses. The discovery of the extreme lightness of the pith of the stalk has essentially increased the commercial value of the plant. This light, cellular substance is most carefully removed from the stalk and applied to a good many important uses. One of its chief uses is the making of life-saving appliances.

Cork with a buoyancy of one to five, and reindeer's hair with one to ten, have been used. The pith of the sunflower has a buoyancy of one to thirty-five. The latter can be used advantageously in the construction of boats and life-preservers. A sufficient quantity can be worn on a person without any inconvenience. The pith of the larger sunflower stalks is used extensively as a substitute for other materials formerly employed in making moxas for cauterising purposes.

PRICKLY-PEAR JELLY.

Rub off the spines very carefully with a thick cloth. Cut the fruit in half, and for every pound allow a pint of water. Boil till the fruit is almost in a pulp. Strain away the liquid, and for every pint allow the juice of a lemon and a pound of sugar. Simmer gently, removing any scum until the syrup jellies. Cover down with parchment paper, and store for future use. Jelly-making is more suitable for this fruit than jam-making, although the latter can be made by cutting the fruit in half, and then into small pieces, allowing pound for pound of sugar and fruit, with very little water in the bottom of the pan. The colour, like rosella jam or jelly, would be easily spoiled by too much water.

COPRA.

We have received from the Department of Agriculture, Fiji, a very interesting and instructive Bulletin giving the results of coconut experiments in Fiji, by C. H. Knowles, B.Sc. (Lond.), Superintendent of Agriculture. In experiments made with sample seed-nuts, kernels were dried in a room with an iron roof, and sides of copper gauze. For five days the kernels were not exposed to the sun at all, and during that time 37 per cent. of the kernels dried out. In five days more, excellent samples of copra were obtained from all the kernels, and no signs of mould were seen. Each lot of copra was carefully weighed, the percentages of copra in the kernel being from 58·8 to 61·3, the average being 59·9. Analysis of a sample taken from the copra made from one lot of kernels showed that the average content of oil was 60 per cent.

It is further remarked that with 3,854 nuts to make 1 ton of copra, or 193 to make 1 cwt., four nuts per tree per annum will give 1 cwt. of copra per acre with trees set 30 ft. by 30 ft. apart.

Answers to Correspondents.

TO MAKE ORANGE WINE.

NORTH COAST ORCHARDIST, Woombye—

The "Agricultural Gazette" of New South Wales, a few months ago gave the following in reply to a correspondent on the above subject:—

"HOW TO UTILISE THE SURPLUS ORANGE CROP.

"There are no certain data as to how many oranges are required to obtain 100 gallons of juice. It is evident that it depends on the size of fruit, thickness of the peel, on the variety, on the season, and on the pressure exercised in squeezing the fruit. The vessels and utensils required are—One vat in which to ferment the juice, about 150 gallons capacity; two casks of 100 gallons capacity each (one cask is filled with the orange wine, the other is a spare one, in which the wine is racked, so that it is exchanged from one vessel into another at certain periods); a few demijohns and jars; a small hand-press.

"To make 100 gallons of orange wine, an equal quantity of orange juice is obtained from as many fruit as required; to this 300 lb. of cane sugar are added; the whole is well stirred until the sugar is completely dissolved. The following ingredients are also added and well mixed, viz.:—

'Six oz. of ammonia phosphate (at 3s. per lb.); 1 oz. common salt; 1 lb. of cream of tartar (1s. per lb.); 10 lb. fresh wine lees, or 8 oz. beer yeast. Mix everything thoroughly in the juice; throw a sheet or a blanket over the vat, which should be placed in a cool room in a corner out of the reach of the sun. It is important that the juice be extracted from the fruit as rapidly as possible. The oranges are split in halves and quickly squeezed; a small press, all of wood—without iron fittings—would help very much, but care should be taken not to exercise a very strong pressure. Fermentation will gradually set in, and when this is completed and the juice is quite still, it is racked off and stored in one of the casks, leaving an ullage of 5 or 6 gallons, which are put in demijohns. An hydraulic bung is put in the bung-hole so as to allow of the escape of any residual carbonic acid. When the water in the hydraulic bung has ceased from bubbling, the ullage is filled and the cask bunged tight.

"The cost of making 100 gallons of orange wine will amount to about £10, including labour. Naturally, the outlay is not included in this estimate, and the outlay would be about £20 for the purchase of vat, casks, a small press, &c. A great saving might be effected by purchasing second-hand vessels. Good clean casks which have served to store wine, brandy, whisky, sherry, or port can be safely used. The orange wine so made is an intoxicant, and a person would not be authorised to sell it without first obtaining a license."

THE ALGAROBA BEAN.

E. Keely, Kingsthorpe—

As we advised you by letter, the bean you have is the fruit of the Algaroba or Mezquit tree (*Prosopis juliflora*). Another kind is known also as Carob Locust and St. John's Bread (*Ceratonia siliqua*). The

Plate 18:—The Algaroba or Mezquit Bean.

dried pods are very sweet, and are largely sold by grocers on the continent, especially to school children. Herewith is an illustration of an Algaroba tree about 30 ft. high and five years old, growing at the Kamerunga State Nursery, Cairns, at the time the photograph was taken early in 1900. The beans make excellent fodder for stock.

GRAFTING THE GRAPE VINE.

"STANTHORPE"—

Mr. C. Ross, Instructor in Fruit Culture, to whom your questions were submitted, replies:—

Question 1.—Are grafted vines more vigorous and more profitable than rooted cuttings?

Answer. This depends on the vigour of the variety of stock and that of the parent of the scion. If the scion is from a weaker variety than the stock, extra vigour will be produced, and *vice versâ*. A shy-bearing variety if worked over a weaker variety of stock tends to produce more fruit and less wood.

Question 2.—To what plants do nurserymen refer when they mention Riparia or Rupestris?

Answer. These names refer to indigenous American vines and their many hybrids. The Riparia class is more suitable for moist situations and the Rupestris for dry and gravelly soils.

Question 3.—How can these plants be most easily raised as stocks for the foundation of a vineyard?

Answer. By cuttings.

Question 4.—Are there any other stocks suitable for grafting?

Answer. Besides those mentioned there is a very large number of varieties with their hybrids used as stocks for the prevention of Phylloxera. The following are a few, viz.:—Labusca, Æstivalis, Berlandion, Cordifolia, &c. The old Issabella and Lenoir also make good stocks. The Black Hamburg is a good stock upon which to work Muscat of Alexandria. The better setting of the fruit is facilitated, and there is more regularity in the size of the berries.

Question 5.—What is the best method of grafting upon the stock, and when should this be done?

Answer. The "Old English Cleft" or the "Whip Tongue" grafts. *See* article in last journal.

Question.—Lime and sulphur mixture preparations from Southern manufacturers?

Answer. Apply to Buzacott for ready-made lime and sulphur wash. *See* pamphlet for lime-sulphur formula. If made accordingly, no test is required.

ROSELLAS.

ROSELLA, Yeronga—

It is much too early to sow rosella seed. The proper time in the South is October. In the North, sowings may be made in November and December. When planting, the rows should be 5 or 6 ft. apart, and the plants in the rows 4 ft. The yield per plant is from 2½ to 4 lb. The number of plants per acre would be 1,742. Planted at distances 5 by 4 ft., the number would be 2,178.

A LEAKY TANK.

H., Woombye—

Wash off all dirt from the seams. Work into a putty one-fifth part of sulphate of iron, one-tenth of chloride of ammonia, and the balance lime or Portland cement. Apply this to the joints, and when it has set hard, paint inside and out with Portland cement and boiled linseed oil mixed together in such proportions as will produce a paint of the consistency of cream. Give a second coat of this in a day or two. It will take a little time to harden, and is elastic.

LIGHTNING METHOD OF TANNING SKINS.

RABBITER, Out West—

In the issue of this Journal for October, 1915, we gave the recipe for rapidly tanning skins. As you have probably not seen the Journal, we give you the recipe, which is:—

"The lightning or sulphuric acid process is the quickest method of tanning wallaby, rabbit, and other skins, and is a very simple one. Pour 5 or 6 quarts of boiling water over 2 quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to blood-warm water as much salt as will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add an ounce of sulphuric acid (H_2SO_4). Immerse the skins in the liquor, stirring them occasionally till tanned, which will be in about twenty minutes. When tanned, rinse in clean water, and hang out in shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft, and all flesh and grease should be well cleansed from them."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1916.

Article.		APRIL. Prices.
Bacon	lb.	1s. 4½d.
Bran	ton	£5 10s.
Broom Millet	,,	£37
Butter	cwt.	130s. 8d.
Chaff, Mixed	ton	£6 15s.
Chaff, Oaten	,,	£5 5s. to £6
Chaff, Lucerne	,,	£6 to £9
Chaff, Wheaten	,,	£5
Cheese	lb.	9½d. to 9¾d.
Flour	ton	£12 5s.
Hams	lb.	1s. 1d.
Hay, Oaten (Victorian)	ton	...
Hay, Lucerne	,,	£6 to £7
Honey	lb.	4½d.
Maize	bush.	5s. 2d.
Oats	,,	3s. 9d.
Onions	ton	£6 10s. to £7 10s.
Peanuts	lb.	3d. to 3½d.
Pollard	ton	£6
Potatoes	,,	£9 10s. to £11 10s.
Potatoes (Sweet)	cwt.	5s. 3d. to 6s.
Pumpkins	ton	£3 10s. to £4 10s.
Eggs	doz.	1s. to 2s. 4d.
Fowls	pair	5s. 6d. to 8s.
Ducks, English	,,	4s.
Ducks, Muscovy	,,	5s. 6d to 7s. 6d.
Geese	,,	8s. to 8s. 6d.
Turkeys (Hens)	,,	11s. to 13s.
Turkeys (Gobblers)	,,	15s. to 18s.
Wheat	bush.	5s. 6d. to 6s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	2s. to 7s. 6d.
Beans, per sugar bag	2s. 6d. to 4s. 6d.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	9d. to 1s. 3d.
Chocos, per quarter-case	...
Cucumbers, per dozen	6d to 9d.
Custard Marrows, per dozen	1s. to 1s. 9d.
Vegetable Marrows, per dozen	1s. to 1s. 9d.
Lettuce, per dozen	9d. to 1s
Peas, per sugar bag	6s. to 9s.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	...
Sweet Potatoes, per cwt.	5s. 3d. to 6s.
Table Pumpkins, per dozen	2s. to 5s. 6d.
Tomatoes, per quarter-case	2s. to 3s.
Turnips, per dozen bunches	8d. to 1s.
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Queensland), per case	10s. to 12s.
Bananas (Fiji), per case	14s. to 15s.
Bananas (G.M.), per case	16s. to 17s.
Mandarins, per case	...
Mangoes, per case	...
Oranges (Navel), per case	..
Oranges (other), per case	...
Passion Fruit, per half-bushel case	5s. to 9s.
Lemons (Local), per bushel case	12s. to 18s.
Papaw Apples, per double-case	.
Persimmons, per half-case	...
Pineapples (Queens), per double-case	9s. to 10s.
Pineapples (Ripleys), per double-case	5s. to 7s.
Pineapples (Common), per double-case	5s. to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Cucumbers, per case	..

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	APRIL. Prices.
Apples, American, per case	6s. to 7s.
Apples, Cooking, per quarter-case	6s. to 6s. 6d.
Apricots, per quarter-case	...
Bananas (Cavendish), per dozen	3d. to 6½d.
Bananas (Sugar), per dozen	3d. to 4½d.
Cherries, per case	...
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	4s. to 7s.
Granadillas	...
Lemons (Lisbon), per case	5s. to 10s.
Lemons (Italian), per case	25s. to 27s. 6d.
Limes, per quarter-case	...
Mandarins (Local), per half-case	9s. to 11s.
Mangoes, per case	7s. to 9s.
Nectarines, per quarter-case	...
Oranges (American, Navel), per case	25s.
Oranges (other), per case	8s. to 10s.
Papaw Apples, per quarter-case	3s. 6d. to 4s.
Passion Fruit, per quarter-case	3s. to 6s. 6d.
Peaches, per case	9s. to 9s. 6d.
Pears, per half-bushel case	6s. 6d. to 10s.
Peanuts, per pound	3d. to 3½d.
Persimmons, per quarter-case	3s. to 5s.
Plums, per half-bushel case	4s.
Pineapples (Ripleys), per dozen	5s. 6d. to 8s. 6d.
Pineapples (Rough), per dozen	2s. 6d to 5s. 6d.
Pineapples (Smooth), per dozen	1s. 9d. to 7s.
Quinces, per case	3s. 6d. to 6s.
Rockmelons, per dozen	...
Rosellas, per sugar bag	...
Strawberries, per dozen pint boxes	...
Tomatoes, per quarter-case	1s. to 2s. 6d.
Piemelons	...
Watermelons, per dozen	3s. to 6s.

TOP PRICES, ENOGGERA YARDS, MARCH, 1916.

Animal.	MARCH. Prices.
Bullocks	£16 10s. to £21 15s.
Bullocks (Single)	...
Cows	£10 10s. to £15 7s. 6d.
Merino Wethers	37s. 6d.
Crossbred Wethers	38s.
Merino Ewes	26s. 6d.
Crossbred Ewes	36s. 6d.
Lambs	39s. 9d.
Pigs (Porkers)	81s.
Pigs (Slips)	...

LONDON QUOTATIONS.

London, April 8.

Large frozen rabbits are very firm. New South Wales blues, ex store, are quoted at 24s. 6d. per crate, but small are practically unsaleable, although offered at 15s.

The Liverpool quotation for middling American cotton, April-May shipment, is 7.47½d. per lb.; May-June, 7.81½d.

Jute: March-April shipment, from Calcutta, £33 15s. per ton.

Hemp: New Zealand, March-May shipment, £48 10s.; Mauritius, £37-£40.

Rubber: Fine, hard Pará, 3s. 0⅝d. per lb.; plantation, first latex crepe, 3s. 4½d.; smoked sheet, 3s. 4d.

Copra: South Sea, February-April shipment, £35 15s. per ton.

Raw linseed oil: Spot pipes, £38 10s. per ton.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1916.	Mar., 1915.		Mar.	No. of Years' Records.	Mar., 1916.	Mar., 1915.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	9·19	15	3·76	0·69					
Cairns	19·25	34	5·74	4·74	Nanango	3·46	34	2·14	0·12
Cardwell	16·98	44	6·34	0·99	Rockhampton ...	5·35	29	3·25	0·03
Cooktown	15·39	40	16·11	2·58	Woodford	8·87	29	2·08	0·06
Herberton	8·54	29	3·67	0·58	Yandina	10·82	21	6·60	0·06
Ingham	16·69	24	13·81	3·87					
Innisfail	26·58	35	15·33	3·44					
Mossman	25·26	5	6·10	4·80	*Darling Downs.*				
Townsville	8·36	45	7·06	0·02					
					Dalby	2·89	46	4·37	0·39
					Emu Vale	2·99	17	1·30	0·13
Central Coast.					Jimbour	2·84	24	3·43	0·25
					Miles	2·85	31	4·54	Nil
Ayr	8·19	29	4·02	0·17	Stanthorpe ...	2·88	43	1·28	0·36
Bowen	6·27	45	0·58	0·09	Toowoomba ...	4·07	44	2·35	0·27
Charters Towers ...	3·79	34	2·75	2·32	Warwick	3·11	29	1·18	0·80
Mackay	12·88	45	4·64	2·37					
Proserpine	13·90	13	3·77	1·35					
St. Lawrence ...	6·43	45	1·87	Nil	*Maranoa.*				
					Roma	3·00	42	2·80	0·10
South Coast.									
Biggenden	4·89	14	2·27	Nil	*State Farms, &c.*				
Bundaberg	5·73	33	3·26	0·07					
Brisbane	6·02	65	1·38	0·11	Gatton College ...	4·22	14	2·12	0·64
Childers	5·61	21	2·19	0·15	Gindie	3·06	13	1·34	0·07
Crohamhurst ...	13·44	22	3·06	0·25	Kamerunga Nurs'y	17·17	27	5·15	3·72
Esk	5·16	29	3·27	0·48	Kairi	...	...	...	0·75
Gayndah	3·37	45	1·40	Nil	Sugar Experiment Station, Mackay	13·53	16	3·48	3·97
Gympie	6·61	46	3·87	0·02	Bungeworgorai ...	1·86	3	1·61	Nil
Glasshouse M'tains	11·69	6	2·00	0·10	Warren	2·39	3	2·84	Nil
Kilkivan	4·28	37	3·28	Nil	Hermitage ...	3·42	7	1·56	0·46
Maryborough ...	6·67	45	3·48	0·29					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year and for the same period of 1915, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE SECOND FOUR MONTHS OF 1916.

Date	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·10	6·17	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5.32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

		H.	M.	
2 May	● New Moon	3	29	p.m.
10 „	☾ First Quarter	6	47	„
18 „	○ Full Moon	12	11	a.m.
24 „	☽ Last Quarter	3	16	p.m.

The moon will be farthest from the earth on the 7th, and nearest on the 19th.

1 June	● New Moon	5	37	a.m.
9 „	☾ First Quarter	9	59	„
16 „	○ Full Moon	7	42	„
22 „	☽ Last Quarter	11	16	p.m.
30 „	● New Moon	8	43	..

The moon will be farthest from the earth on the 4th, and nearest on the 16th at midnight.

8 July	☾ First Quarter	9	55	a.m.
15 „	○ Full Moon	2	40	„
22 „	☽ Last Quarter	9	33	„
30 „	● New Moon	12	15	p.m.

The moon will be nearest to the earth on the 15th, and farthest from it on the 28th.

7 Aug.	☾ First Quarter	5	6	a.m.
13 „	○ Full Moon	10	0	p.m.
21 „	☽ Last Quarter	10	52	„
29 „	● New Moon	3	25	a.m.

The moon will be nearest to the earth on the 12th, and farthest from it on the 25th.

A partial eclipse of the moon will occur on 15th July at 2·30 p.m., when the moon will be below the horizon in Australia.

An eclipse of the sun will take place on 30th July. It will be partial only in Queensland but annular, or leaving the edge of the sun visible as a magnificent golden ring at Adelaide, and in a line across the south-west of Australia.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during May, June, July, and to the middle of August may be roughly arrived at by adding 20 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme mint &c. Eschalots, if ready, may be transplanted; also, horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist Spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the Summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly,

so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) as least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the Spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frost, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth, and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to overproduce fruit spurs, which become long and straggling, and bear a large quantity of small-size fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses or loose bark in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.